CFR 47 FCC PART 15 SUBPART C
ISED RSS-247 ISSUE 2

CERTIFICATION TEST REPORT

For

DECORAPORT®LED MIRROR

MODEL NUMBER:
W60-B1-NW-DX-WWHH, W60-B1-NW-D1-7032, W60-B1-NW-D1-6036, W60-B1-NW-D1-5536, W60-B1-NW-D1-5528, W60-B1-NW-D2-7032, W60-B1-NW-D2-6036, W60-B1-NW-D2-5536, W60-B1-NW-D2-4836, W60-B1-NW-D3-6036, W60-B1-NW-D3-5536, W60-B1-NW-D3-4836, W60-B1-NW-D4-6036, W60-B1-NW-D4-5536, W60-B1-NW-D4-4836, W60-B1-NW-D5-6036, W60-B1-NW-D5-5536, W60-B1-NW-D5-4836

FCC ID: 2AYMPW60B1NWD

IC: 26852-W60B1NWD

REPORT NUMBER: 4789579338.1-F1

ISSUE DATE: Dec. 25, 2020

Prepared for

DECORAPORT (WEIHAI) LTD
Floor 5, Building A, Haiyucity plaza, Weihai, Shandong

Prepared by

UL-CCIC COMPANY LIMITED
No. 2, Chengwan Road, Suzhou Industrial Park, People's Republic of China
Tel: +86 769 22038881
Fax: +86 769 33244054
Website: www.ul.com

The results reported herein have been performed in accordance with the laboratory's terms of accreditation. This report shall not be reproduced except in full without the written approval of the Laboratory. The results in this report apply to the test sample(s) mentioned above at the time of the testing period only and are not to be used to indicate applicability to other similar products. This report does not imply that the product(s) has met the criteria for certification.

Revision History

Rev.	Issue Date	Revisions	Revised By
V0	25/12/2020	Initial Issue	--

This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

Summary of Test Results			
Clause	**Test Items**	**FCC/IC Rules**	**Test Results**
1	20dB Bandwidth and 99% Occupied Bandwidth	FCC 15.247 (a) (1) RSS-247 Clause 5.1 (a) RSS-GEN Clause 6.7	Pass
2	Conducted Output Power	FCC 15.247 (b) (1) RSS-247 Clause 5.1 (b)	Pass
3	Carrier Hopping Channel Separation	FCC 15.247 (a) (1) RSS-247 Clause 5.1 (b)	Pass
4	Number of Hopping Frequency	15.247 (a) (1) III RSS-247 Clause 5.1 (d)	Pass
5	Time of Occupancy (Dwell Time)	15.247 (a) (1) III RSS-247 Clause 5.1 (d)	Pass
6	Conducted Bandedge and Spurious Emission	FCC 15.247 (d) RSS-247 Clause 5.5	Pass
7	Radiated Bandedge and Spurious Emission	FCC 15.247 (d) FCC 15.209 FCC 15.205 RSS-247 Clause 5.5 RSS-GEN Clause 8.9 RSS-GEN Clause 8.10	Pass
8	Conducted Emission Test For AC Power Port	FCC 15.207 RSS-GEN Clause 8.8	Pass
9	Antenna Requirement	FCC 15.203 RSS-GEN Clause 6.8	Pass
Remark: 1) The measurement result for the sample received is <Pass> according to < CFR 47 FCC PART 15 SUBPART C, ISED RSS-GEN Issue 5 and ISED RSS-247 Issue 2> when <Accuracy Method> decision rule is applied.			

This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

TABLE OF CONTENTS

1.# ATTESTATION OF TEST RESULTS ..... 6#

2.# TEST METHODOLOGY ..... 7#

3.# FACILITIES AND ACCREDITATION ..... 7#

4.# CALIBRATION AND UNCERTAINTY ..... 8#

4.1.# MEASURING INSTRUMENT CALIBRATION ..... 8#

4.2.# MEASUREMENT UNCERTAINTY ..... 8#

5.# EQUIPMENT UNDER TEST ..... 9#

5.1.# DESCRIPTION OF EUT ..... 9#

5.2.# MAXIMUM OUTPUT POWER ..... 9#

5.3.# PACKET TYPE CONFIGURATION ..... 9#

5.4.# CHANNEL LIST ..... 10#

5.5.# TEST CHANNEL CONFIGURATION ..... 10#

5.6.# THE WORSE CASE POWER SETTING PARAMETER ..... 10#

5.7.# DESCRIPTION OF AVAILABLE ANTENNAS ..... 11#

5.8.# WORST-CASE CONFIGURATIONS ..... 11#

5.9.# TEST ENVIRONMENT ..... 11#

5.10.# DESCRIPTION OF TEST SETUP ..... 12#

5.11.# MEASURING INSTRUMENT AND SOFTWARE USED ..... 13#

6.# ANTENNA PORT TEST RESULTS ..... 15#

6.1.# ON TIME AND DUTY CYCLE ..... 15#

6.2.# 20 dB OCCUPIED BANDWIDTH AND 99% OCCUPIED BANDWIDTH ..... 18#

6.2.1.# GFSK MODE ..... 19#

6.2.2.# π/4-DQPSK MODE ..... 21#

6.2.3.# 8DPSK MODE ..... 23#

6.3.# CONDUCTED OUTPUT POWER ..... 25#

6.3.1.# GFSK MODE ..... 26#

6.3.2.# Π/4-DQPSK ..... 26#

6.3.3.# 8DPSK MODE ..... 27#

6.4.# CARRIER HOPPING CHANNEL SEPARATION ..... 28#

6.4.1.# GFSK MODE ..... 29#

6.4.2.# Π/4-DQPSK MODE ..... 31#

6.4.3.# 8DPSK MODE ..... 33#

6.5.# NUMBER OF HOPPING FREQUENCY ..... 35#

6.5.1.# GFSK MODE ..... 36#

This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

6.5.2.# Π/4-DQPSK MODE ..... 37#
6.5.3.# 8DPSK MODE ..... 38#

6.6.# TIME OF OCCUPANCY (DWELL TIME) ..... 39#
6.6.1.# GFSK MODE ..... 40#
6.6.2.# π/4-DQPSK MODE ..... 42#
6.6.3.# 8DPSK MODE ..... 44#

6.7.# CONDUCTED BANDEDGE AND SPURIOUS EMISSION ..... 46#
6.7.1.# GFSK MODE ..... 47#
6.7.2.# π/4-DQPSK MODE ..... 51#
6.7.3.# 8DPSK MODE ..... 55#

7.# RADIATED TEST RESULTS ..... 59#

7.1.# LIMITS AND PROCEDURE ..... 59#

7.2.# RESTRICTED BANDEDGE ..... 64#
7.2.1.# GFSK MODE ..... 64#

7.3.# SPURIOUS EMISSIONS (1~25GHz) ..... 68#
7.3.1.# GFSK MODE ..... 68#

7.4.# SPURIOUS EMISSIONS BELOW 30M ..... 74#

7.5.# SPURIOUS EMISSIONS 30M – 1GHz ..... 75#

8.# AC POWER LINE CONDUCTED EMISSIONS ..... 77#

ANTENNA REQUIREMENTS ..... 80#

This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

1. ATTESTATION OF TEST RESULTS

Applicant Information

Company Name:	DECORAPORT (WEIHAI) LTD
Address:	Floor 5, Building A, Haiyucity plaza, Weihai, Shandong

Manufacturer Information

Company Name:	SHANDONG OUSHENG LTD
Address:	Beijipo Street, High-Tech Zone, Taian City, Shandong

EUT Description

EUT Name:	DECORAPORT®LED MIRROR
Model:	W60-B1-NW-DX-WWHH, W60-B1-NW-D1-7032, W60-B1-NW-D1-6036, W60-B1-NW-D1-5536, W60-B1-NW-D1-5528, W60-B1-NW-D2-7032, W60-B1-NW-D2-6036, W60-B1-NW-D2-5536, W60-B1-NW-D2-4836, W60-B1-NW-D3-6036, W60-B1-NW-D3-5536, W60-B1-NW-D3-4836, W60-B1-NW-D4-6036, W60-B1-NW-D4-5536, W60-B1-NW-D4-4836, W60-B1-NW-D5-6036, W60-B1-NW-D5-5536, W60-B1-NW-D5-4836
Brand Name:	N/A
Sample Status:	Normal
Sample ID:	N/A
Sample Received Date:	Sept 09, 2020
Date of Tested:	Sept 09, 2020 ~ Dec. 24, 2020

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 FCC PART 15 SUBPART C	PASS
ISED RSS-247 Issue 2	PASS
ISED RSS-GEN Issue 5	PASS

Prepared By:

Robbin Shi

Robbin Shi
Project Engineer

Approved By:

Tom Tang

Tom Tang
Engineer Project Associate

Authorized By:

Chris Zhong

Chris Zhong
Laboratory Leader

This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with KDB414788 D01 Radiated Test Site v01, ANSI C63.10-2013, CFR 47 FCC Part 2, CFR 47 FCC Part 15, RSS-GEN Issue 5, and RSS-247 Issue 2.

3. FACILITIES AND ACCREDITATION

Accreditation Certificate	**A2LA (Certificate No.: 4338.01)** Shenzhen STS Test Services Co., Ltd. has been assessed and proved to be in compliance with A2LA. **CNAS (Registration No.: L7649)** Shenzhen STS Test Services Co., Ltd. has been assessed and proved to be in compliance with CNAS. **FCC (FCC Designation No.: 625569)** Shenzhen STS Test Services Co., Ltd. has been recognized to perform compliance testing on equipment subject to the Commission's Delcaration of Conformity (DoC) and Certification rules **IC(Company No.: 12108A)** Shenzhen STS Test Services Co., Ltd. has been registered and fully described in a report filed with Industry Canada. The Company Number is 12108A.

Note: All tests measurement facilities use to collect the measurement data are located at A 1/F, Building B, Zhuoke Science Park, No.190 Chongqing Road, HepingShequ, Fuyong Sub-District, Bao'an District, Shenzhen, Guang Dong, China

This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

No.	Item	Uncertainty
1	RF output power, conducted	±0.68dB
2	Unwanted Emissions, conducted	±2.988dB
3	All emissions, radiated 9K-30MHz	±2.68dB
4	All emissions, radiated 30M-1GHz	±4.39dB
5	All emissions, radiated 1G-6GHz	±5.10dB
6	All emissions, radiated 6G-18GHz	±5.48dB
7	All emissions, radiated 18G-25GHz	±5.62dB
8	Conducted Emission (9KHz-150KHz)	±2.79dB
9	Conducted Emission (150KHz-30MHz)	±2.80dB

This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

Equipment	DECORAPORT®LED MIRROR	
Model Name	W60-B1-NW-D1-7032	
Serial Model	W60-B1-NW-DX-WWHH, W60-B1-NW-D1-6036, W60-B1-NW-D1-5536, W60-B1-NW-D1-5528, W60-B1-NW-D2-7032, W60-B1-NW-D2-6036, W60-B1-NW-D2-5536, W60-B1-NW-D2-4836, W60-B1-NW-D3-6036, W60-B1-NW-D3-5536, W60-B1-NW-D3-4836, W60-B1-NW-D4-6036, W60-B1-NW-D4-5536, W60-B1-NW-D4-4836, W60-B1-NW-D5-6036, W60-B1-NW-D5-5536, W60-B1-NW-D5-4836	
Model Difference:	DX represent difference of mirror's external appearance; WW is mirror/LED tape's width, and HH is mirror/LED tape's height.	
Product Description (Bluetooth)	Operation Frequency	2402 MHz ~ 2480 MHz
	Modulation Type	Data Rate
	GFSK	1Mbps
	∏/4-DQPSK	2Mbps
	8DPSK	3Mbps
Bluetooth Version	BT4.1+EDR	
Test Voltage:	AC 120V/60Hz	

5.2. MAXIMUM OUTPUT POWER

Bluetooth Mode	Frequency (MHz)	Channel Number	Max Output Power (dBm)	EIRP (dBm)
GFSK	2402-2480	0-78[79]	6.13	8.13
∏/4-DQPSK	2402-2480	0-78[79]	4.43	6.43
8DPSK	2402-2480	0-78[79]	4.79	6.79

5.3. PACKET TYPE CONFIGURATION

Test Mode	Packet Type	Setting(Packet Length)
GFSK	DH1	27
	DH3	183
	DH5	339
∏/4-DQPSK	2-DH1	54
	2-DH3	367
	2-DH5	679
8DPSK	3-DH1	83
	3-DH3	552
	3-DH5	1021

This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

5.4. CHANNEL LIST

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
00	2402	20	2422	40	2442	60	2462
01	2403	21	2423	41	2443	61	2463
02	2404	22	2424	42	2444	62	2464
03	2405	23	2425	43	2445	63	2465
04	2406	24	2426	44	2446	64	2466
05	2407	25	2427	45	2447	65	2467
06	2408	26	2428	46	2448	66	2468
07	2409	27	2429	47	2449	67	2469
08	2410	28	2430	48	2450	68	2470
09	2411	29	2431	49	2451	69	2471
10	2412	30	2432	50	2452	70	2472
11	2413	31	2433	51	2453	71	2473
12	2414	32	2434	52	2454	72	2474
13	2415	33	2435	53	2455	73	2475
14	2416	34	2436	54	2456	74	2476
15	2417	35	2437	55	2457	75	2477
16	2418	36	2438	56	2458	76	2478
17	2419	37	2439	57	2459	77	2479
18	2420	38	2440	58	2460	78	2480
19	2421	39	2441	59	2461	\	\

5.5. TEST CHANNEL CONFIGURATION

Test Mode	Test Channel Number	Test Channel
GFSK	CH 00, CH 39, CH 78	Low, Middle, High
∏/4-DQPSK	CH 00, CH 39, CH 78	Low, Middle, High
8DPSK	CH 00, CH 39, CH 78	Low, Middle, High

5.6. THE WORSE CASE POWER SETTING PARAMETER

The Worse Case Power Setting Parameter under 2400 ~ 2483.5MHz Band				
Test Software		BlueSuite 2.5.8		
Modulation Type	Transmit Antenna Number	Test Channel		
		CH 00	CH 39	CH 78
GFSK	1	255/50	255/50	255/50
∏/4-DQPSK	1	255/50	255/50	255/50
8DPSK	1	255/50	255/50	255/50

This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

5.7. DESCRIPTION OF AVAILABLE ANTENNAS

Ant.	Frequency (MHz)	Antenna Type	Antenna Gain (dBi)
1	2402-2480	PCB	2

Test Mode	Transmit and Receive Mode	Description
GFSK	☒1TX, 1RX	Chain 1 can be used as transmitting/receiving antenna.
∏/4-DQPSK	☒1TX, 1RX	Chain 1 can be used as transmitting/receiving antenna.
8DPSK	☒1TX, 1RX	Chain 1 can be used as transmitting/receiving antenna.

5.8. WORST-CASE CONFIGURATIONS

Bluetooth Mode	Modulation Technology	Modulation Type	Data Rate (Mbps)
BR	FHSS	GFSK	1Mbit/s
EDR	FHSS	∏/4-DQPSK	2Mbit/s
EDR	FHSS	8DPSK	3Mbit/s

Note: Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates.

5.9. TEST ENVIRONMENT

Environment Parameter	Selected Values During Tests	
Relative Humidity	55 ~ 65%	
Atmospheric Pressure:	101kPa	
Temperature	TN	23 ~ 28 °C
Voltage :	VL	N/A
	VN	AC 120V/60Hz
	VH	N/A

Note: VL= Lower Extreme Test Voltage
VN= Nominal Voltage.
VH= Upper Extreme Test Voltage
TN= Normal Temperature

This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

5.10. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Item	Equipment	Brand Name	Model Name	P/N
1	PC	LENOVO	ThinkPad E470	N/A

I/O CABLES

Cable No	Port	Connector Type	Cable Type	Cable Length(m)	Remarks
1	AC LINE	N/A	N/A	1.2M	N/A
2	USB Cable	N/A	N/A	1.5M	N/A

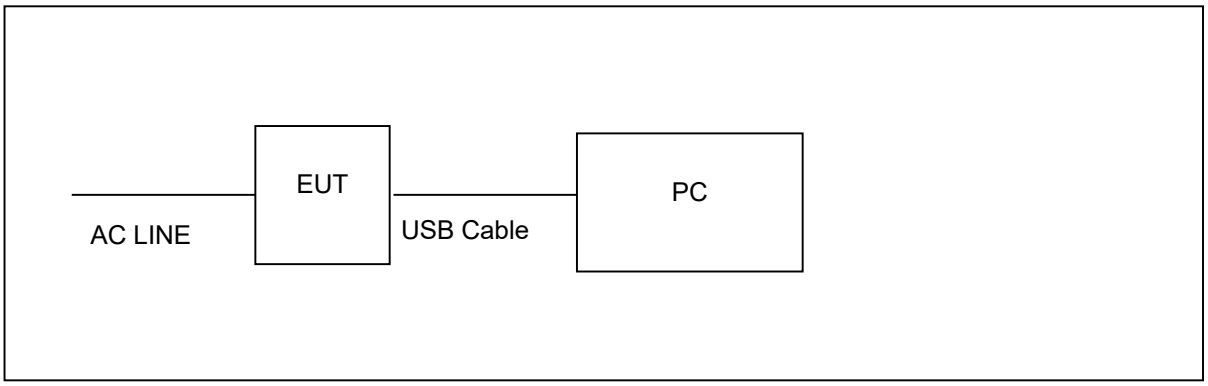
ACCESSORY

Item	Accessory	Brand Name	Model Name	Description
1	N/A	N/A	N/A	N/A

TEST SETUP

The EUT can work in an engineer mode with software through a PC.

SETUP DIAGRAM FOR TESTS



This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

5.11. MEASURING INSTRUMENT AND SOFTWARE USED

Radiation Test equipment

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
Test Receiver	R&S	ESCI	101427	2020.10.12	2021.10.11
Signal Analyzer	R&S	FSV 40-N	101823	2020.10.10	2021.10.09
Active loop Antenna	ZHINAN	ZN30900C	16035	2019.07.11	2021.07.10
Bilog Antenna	TESEQ	CBL6111D	34678	2020.10.12	2022.10.11
Horn Antenna	SCHWARZBECK	BBHA 9120D	02014	2019.10.15	2021.10.14
SHF-EHF Horn Antenna (18G-40GHz)	A-INFO	LB-180400-KF	J211020657	2020.10.12	2022.10.11
Pre-Amplifier (0.1M-3GHz)	EM	EM330	060665	2020.10.12	2021.10.11
Pre-Amplifier (1G-18GHz)	SKET	LNPA-01018G-45	SK2018080901	2020.10.12	2021.10.11
Pre-Amplifier (18G-40GHz)	SKET	LNPA-1840-50	SK2018101801	2020.10.10	2021.10.09
Temperature & Humidity	HH660	Mieo	N/A	2020.10.13	2021.10.12
Turn table	EM	SC100_1	60531	N/A	N/A
Antenna mast	EM	SC100	N/A	N/A	N/A
Band Reject filter(2400-2500MHz)	COM-MW	ZBSF-2400-2500	706	2019.10.12	2020.10.11
Test SW	FARAD	EZ-EMC(Ver.STSLAB-03A1 RE)			

Conduction Test equipment

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
Test Receiver	R&S	ESCI	101427	2020.10.12	2021.10.11
LISN	R&S	ENV216	101242	2020.10.12	2021.10.11
LISN	EMCO	3810/2NM	23625	2020.10.12	2022.10.11
Temperature & Humidity	HH660	Mieo	N/A	2020.10.13	2021.10.12
Test SW	FARAD	EZ-EMC(Ver.STSLAB-03A1 CE)			

This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

RF Connected Test

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
Power Sensor	Keysight	U2021XA	MY55520005	2020.10.10	2021.10.09
			MY55520006	2020.10.10	2021.10.09
			MY56120038	2020.10.10	2021.10.09
			MY56280002	2020.10.10	2021.10.09
Signal Analyzer	Agilent	N9020A	MY51110105	2020.03.05	2021.03.04
Temperature & Humidity	HH660	Mieo	N/A	2020.10.13	2021.10.12
MIMO Power measurement test Set	Keysight	U2021XA	MY55520005	2020.10.10	2021.10.09
Test SW	FARAD	EZ-EMC(Ver.STSLAB-03A1 RE)			

This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

6. ANTENNA PORT TEST RESULTS

6.1. ON TIME AND DUTY CYCLE

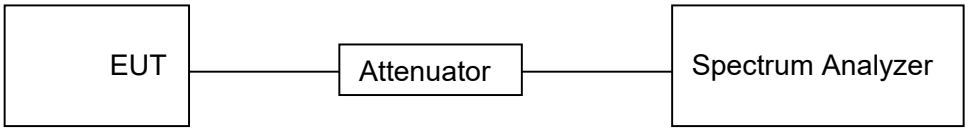
LIMITS

None; for reporting purposes only

PROCEDURE

KDB 558074 Zero-Span Spectrum Analyzer Method

TEST SETUP



TEST ENVIRONMENT

Temperature	23.2°C	Relative Humidity	52 %
Atmosphere Pressure	101 kPa	Test Voltage	AC 120V/60Hz

RESULTS

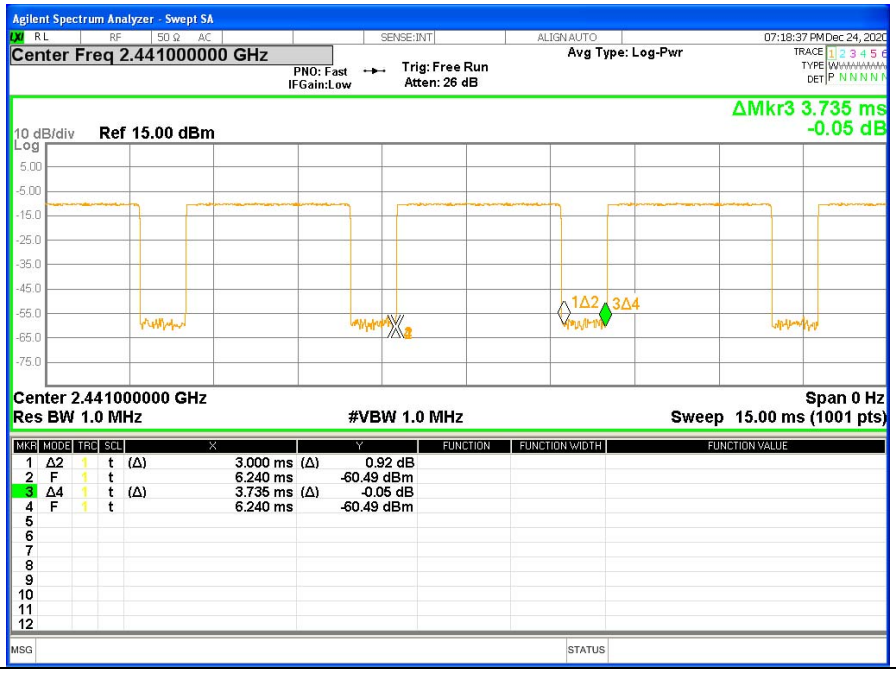
Mode	On Time (msec)	Period (msec)	Duty Cycle x (Linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/T Minimum VBW (kHz)
GFSK	2.985	3.750	0.7960	79.60%	0.99	0.34
π /4-DQPSK	3.000	3.735	0.8032	80.32%	0.95	0.33
8DPSK	3.000	3.750	0.8000	80.00%	0.97	0.33

Note:
Duty Cycle Correction Factor=10log (1/x).
Where: x is Duty Cycle (Linear)
Where: T is On Time
If that calculated VBW is not available on the analyzer then the next higher value should be used.

This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

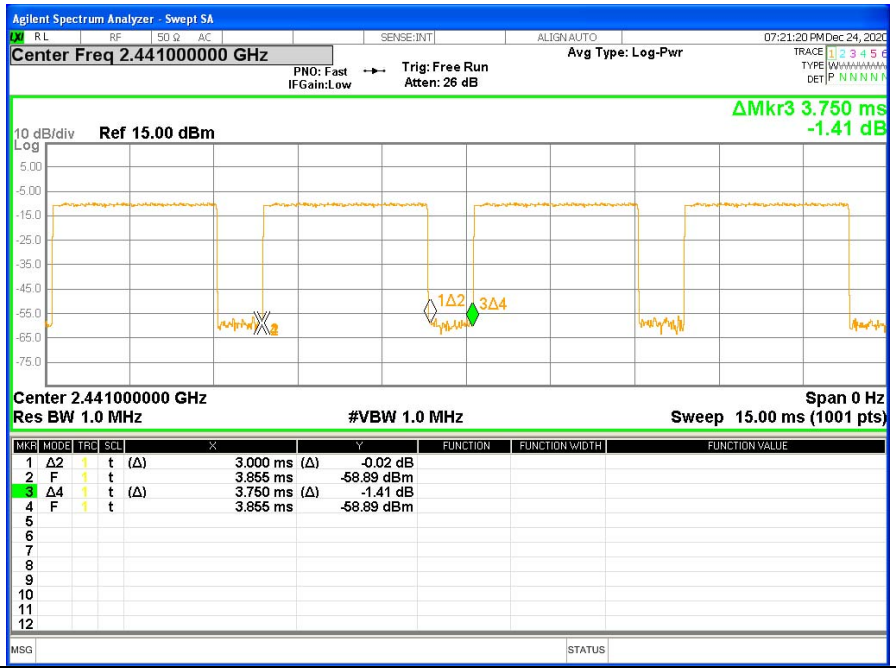
DH5 ON TIME AND DUTY CYCLE MID CH

2DH5 ON TIME AND DUTY CYCLE MID CH



This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

3DH5 ON TIME AND DUTY CYCLE MID CH



This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

6.2. 20 dB OCCUPIED BANDWIDTH AND 99% OCCUPIED BANDWIDTH

LIMITS

CFR 47FCC Part15 (15.247) Subpart C ISED RSS-247 ISSUE 2			
Section	Test Item	Limit	Frequency Range (MHz)
CFR 47 FCC 15.247 (a) (1) RSS-247 Clause 5.1 (a)	20dB Occupied Bandwidth	N/A	2400-2483.5
ISED RSS-Gen Clause 6.7	99% Occupied Bandwidth	N/A	2400-2483.5

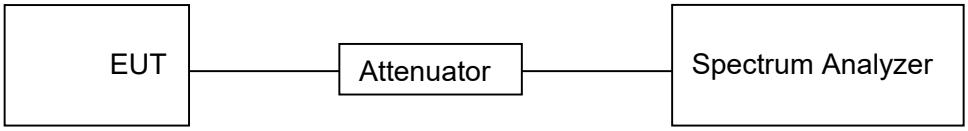
TEST PROCEDURE

Connect the UUT to the spectrum analyser and use the following settings:

Center Frequency	The centre frequency of the channel under test
Detector	Peak
RBW	1% to 5% of the occupied bandwidth
VBW	approximately 3×RBW
Span	approximately 2 to 3 times the 20 dB bandwidth
Trace	Max hold
Sweep	Auto couple

Allow the trace to stabilize and measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 20 dB and 99% relative to the maximum level measured in the fundamental emission.

TEST SETUP



This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

TEST ENVIRONMENT

Temperature	23.2°C	Relative Humidity	52 %
Atmosphere Pressure	101 kPa	Test Voltage	AC 120V/60Hz

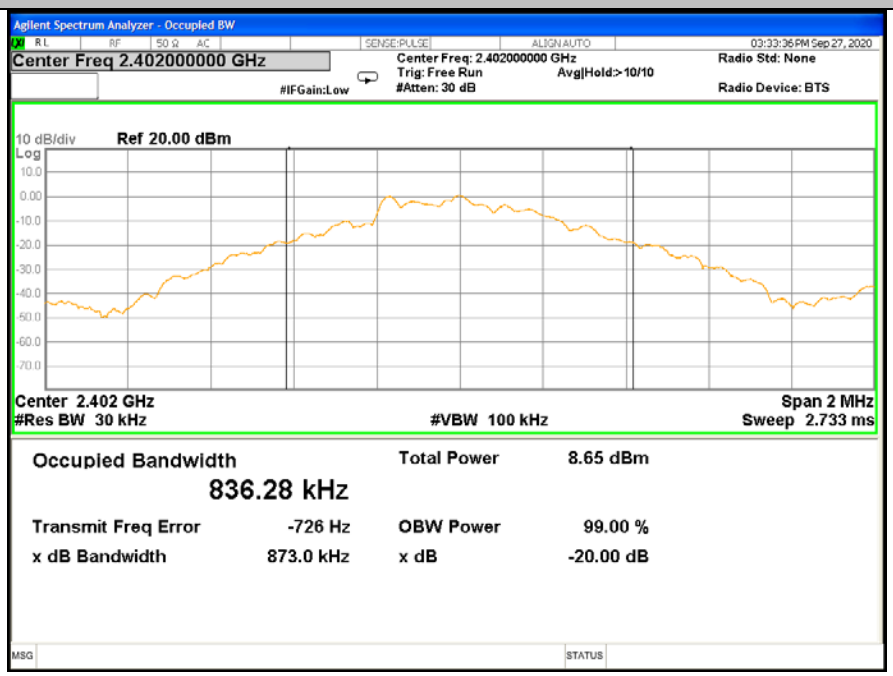
6.2.1. GFSK MODE

RESULTS TABLE

Test Channel	Test Frequency (MHz)	20dB Occupied bandwidth (MHz)	99% Occupied bandwidth (MHz)	Result
Low	2402	0.873	0.836	PASS
Middle	2441	0.880	0.832	PASS
High	2480	0.879	0.831	PASS

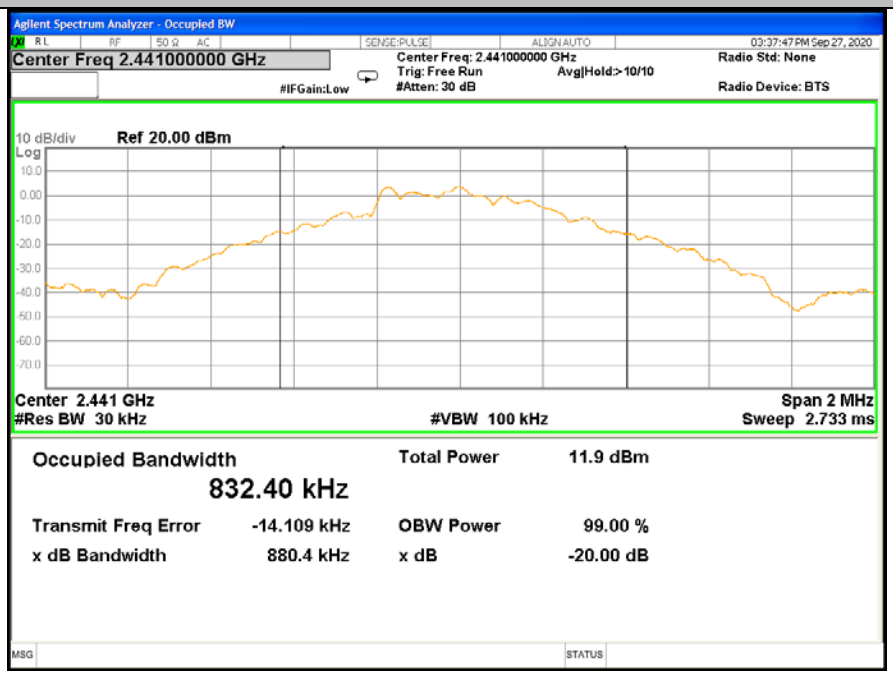
TEST GRAPHS

20dB AND 99% BANDWIDTH LOW CH

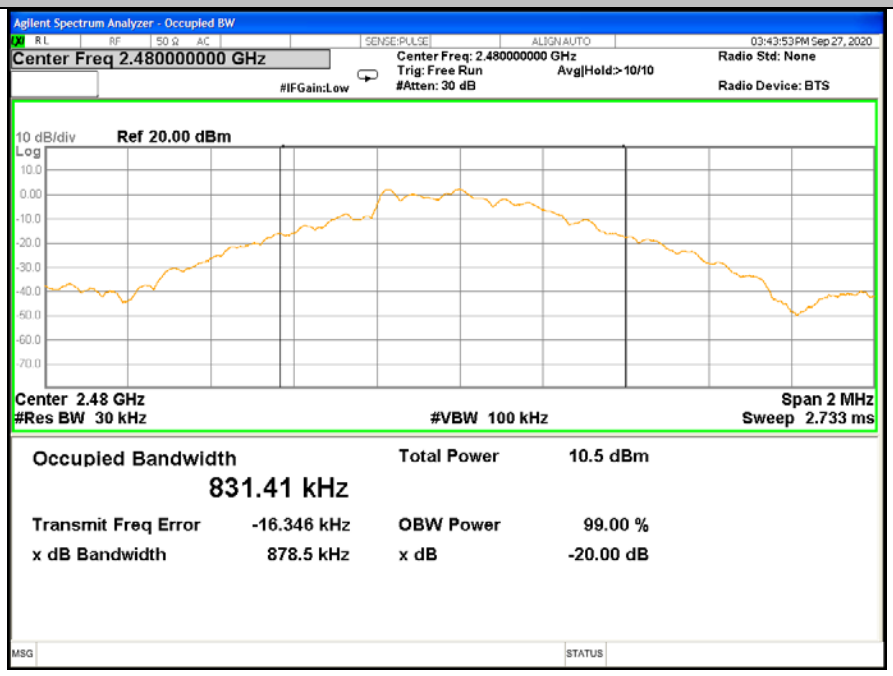


This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

20dB AND 99% BANDWIDTH MID CH



20dB AND 99% BANDWIDTH HIGH CH



This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

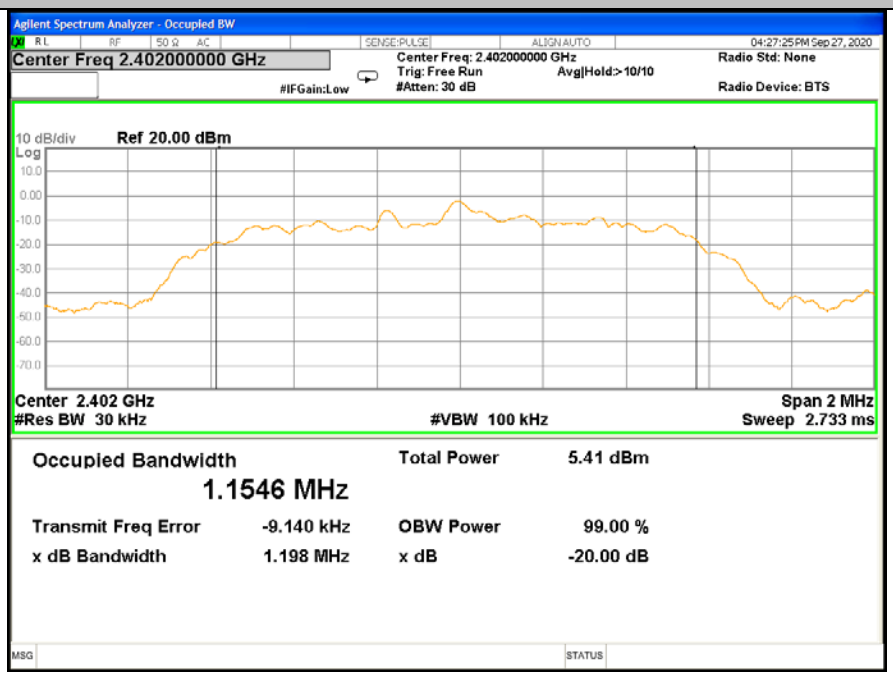
6.2.2. π/4-DQPSK MODE

RESULTS TABLE

Test Channel	Test Frequency (MHz)	20dB Occupied bandwidth (MHz)	99% Occupied bandwidth (MHz)	Result
Low	2402	1.198	1.155	PASS
Middle	2441	1.216	1.157	PASS
High	2480	1.217	1.156	PASS

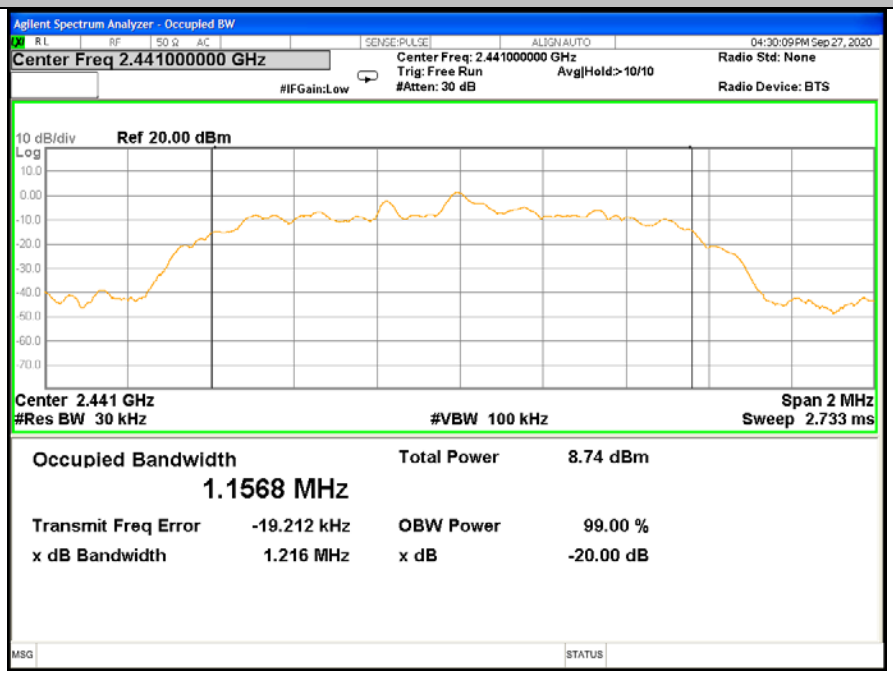
TEST GRAPHS

20dB AND 99% BANDWIDTH LOW CH

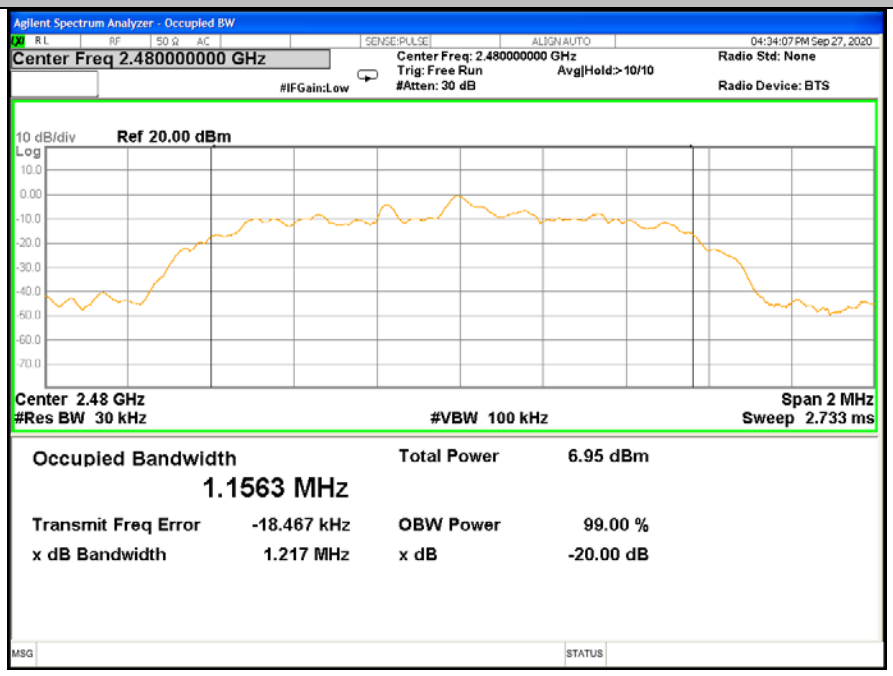


This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

20dB AND 99% BANDWIDTH MID CH



20dB AND 99% BANDWIDTH HIGH CH



This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

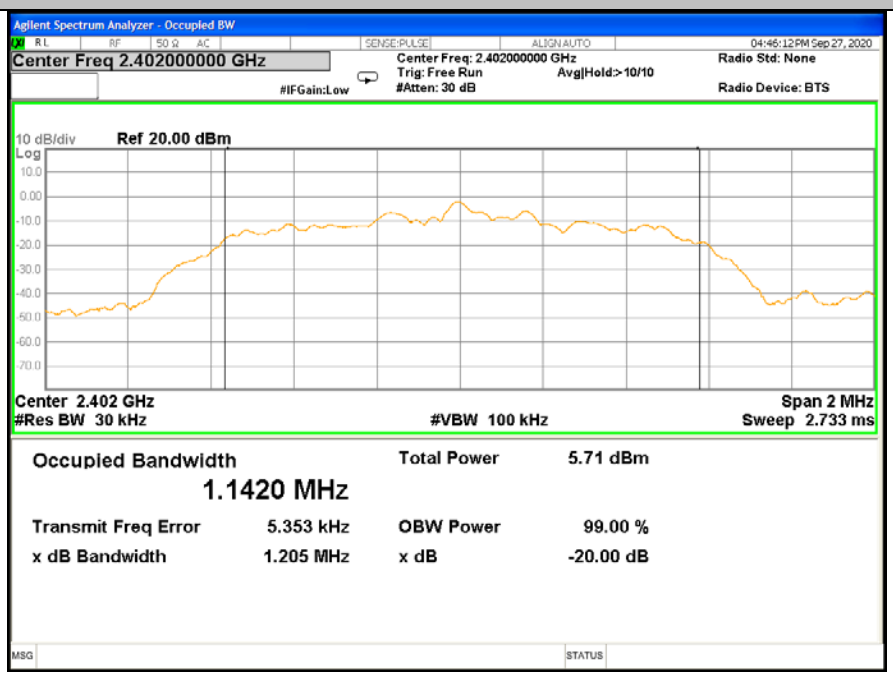
6.2.3. 8DPSK MODE

RESULTS TABLE

Channel	Frequency (MHz)	20dB Occupied bandwidth (MHz)	99% Occupied bandwidth (MHz)	Result
Low	2402	1.205	1.142	PASS
Middle	2441	1.207	1.137	PASS
High	2480	1.206	1.136	PASS

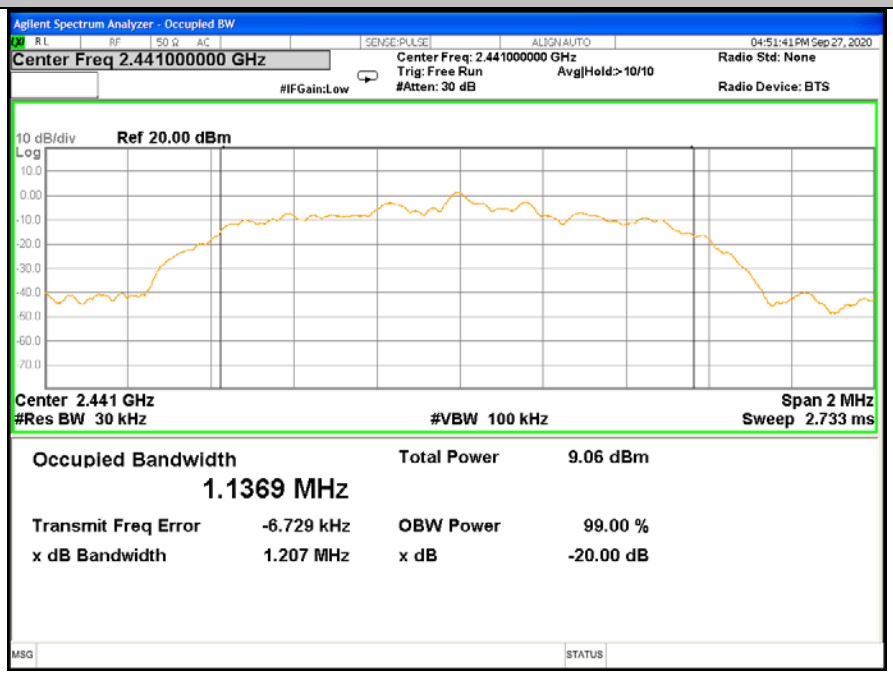
TEST GRAPHS

20dB AND 99% BANDWIDTH LOW CH

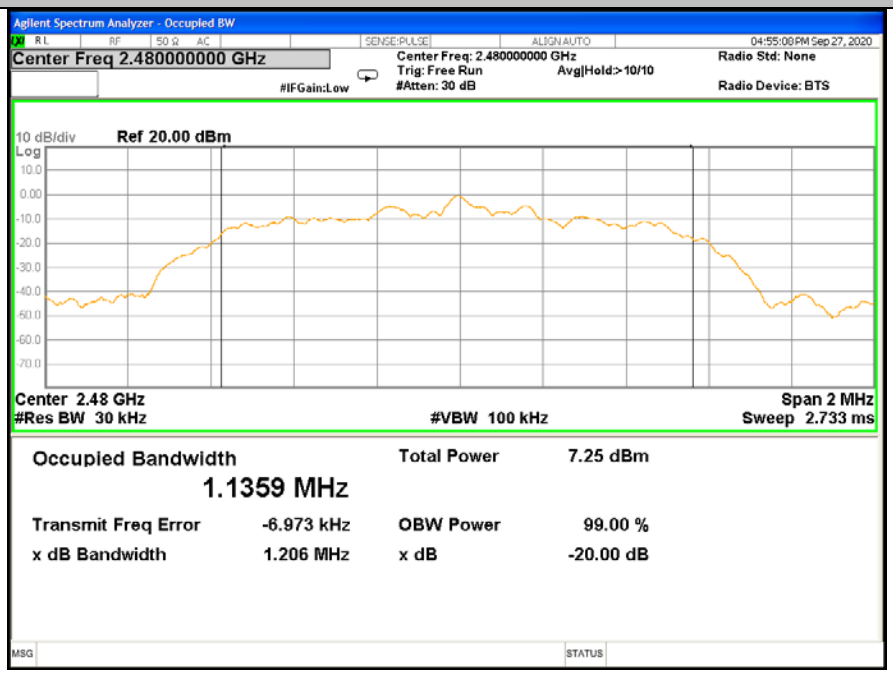


This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

20dB AND 99% BANDWIDTH MID CH



20dB AND 99% BANDWIDTH HIGH CH



This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

6.3. CONDUCTED OUTPUT POWER

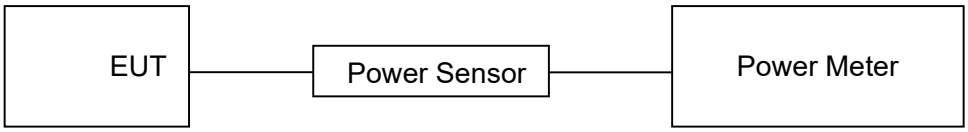
LIMITS

CFR 47 FCC Part15 (15.247) , Subpart C ISED RSS-247 ISSUE 2			
Section	Test Item	Limit	Frequency Range (MHz)
CFR 47 FCC 15.247 (b) (1) ISED RSS-247 Clause 5.4 (b)	Peak Conducted Output Power	1 watt or 30dBm	2400-2483.5

TEST PROCEDURE

Place the EUT on the table and set it in the transmitting mode.
Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the Power sensor.
Measure peak power each channel.

TEST SETUP



This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

TEST ENVIRONMENT

Temperature	23.2°C	Relative Humidity	52 %
Atmosphere Pressure	101 kPa	Test Voltage	AC 120V/60Hz

RESULTS

6.3.1. GFSK MODE

Channel	Frequency (MHz)	Maximum Conducted Output Power(PK) (dBm)	Result
Low	2402	3.21	Pass
Middle	2441	6.13	Pass
High	2480	4.74	Pass

Channel	Frequency (MHz)	Maximum Conducted Output Power(AV) (dBm)	Result
Low	2402	1.72	Pass
Middle	2441	4.71	Pass
High	2480	3.20	Pass

6.3.2. ∏/4-DQPSK

Channel	Frequency (MHz)	Maximum Conducted Output Power(PK) (dBm)	Result
Low	2402	1.29	Pass
Middle	2441	4.43	Pass
High	2480	2.61	Pass

Channel	Frequency (MHz)	Maximum Conducted Output Power(AV) (dBm)	Result
Low	2402	-1.40	Pass
Middle	2441	0.67	Pass
High	2480	-1.36	Pass

This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

6.3.3. 8DPSK MODE

Channel	Frequency	Maximum Conducted Output Power(PK)	Result
	(MHz)	(dBm)	
Low	2402	1.52	Pass
Middle	2441	4.79	Pass
High	2480	2.96	Pass

Channel	Frequency	Maximum Conducted Output Power(AV)	Result
	(MHz)	(dBm)	
Low	2402	-2.61	Pass
Middle	2441	0.67	Pass
High	2480	-0.72	Pass

This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

6.4. CARRIER HOPPING CHANNEL SEPARATION

LIMITS

CFR 47 FCC Part15 (15.247) , Subpart C ISED RSS-247 ISSUE 2			
Section	Test Item	Limit	Frequency Range (MHz)
CFR 47 FCC 15.247 (a) (1) ISED RSS-247 Clause 5.1 (b)	Carrier Hopping Channel Separation	25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater.	2400-2483.5

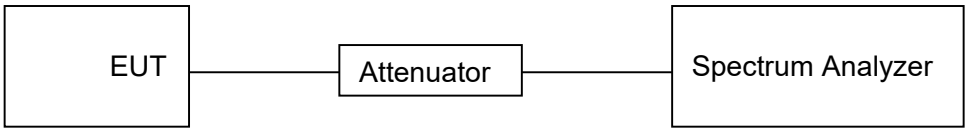
TEST PROCEDURE

Connect the UUT to the spectrum Analyzer and use the following settings:

Center Frequency	The center frequency of the channel under test
Span	wide enough to capture the peaks of two adjacent channels
Detector	Peak
RBW	Start with the RBW set to approximately 30% of the channel spacing; adjust as necessary to best identify the center of each individual channel.
VBW	≥RBW
Trace	Max hold
Sweep time	Auto couple

Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels.
Compliance of an EUT with the appropriate regulatory limit shall be determined.
A plot of the data shall be included in the test report.

TEST SETUP



This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

TEST ENVIRONMENT

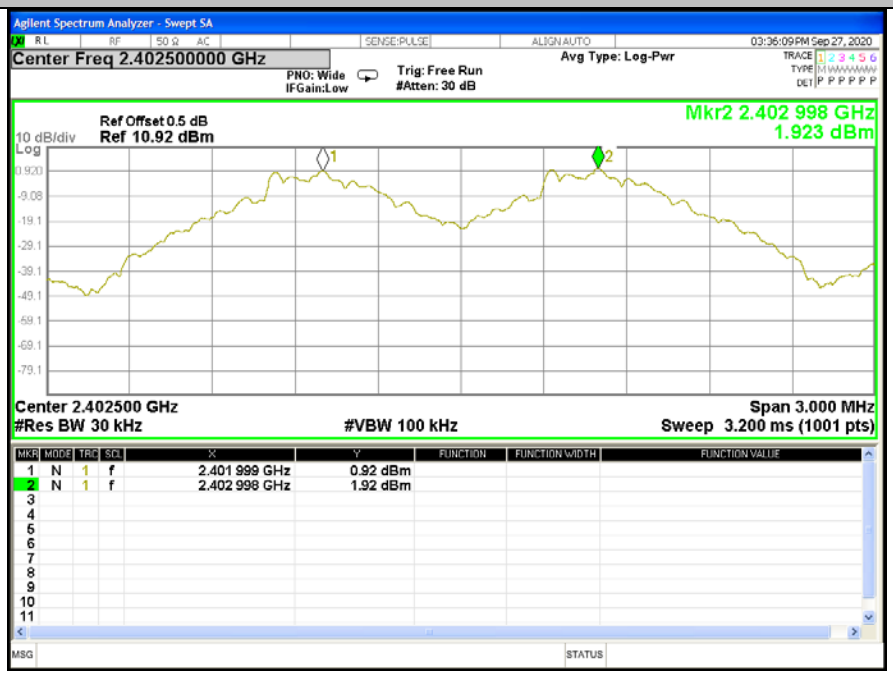
Temperature	23.2°C	Relative Humidity	52 %
Atmosphere Pressure	101 kPa	Test Voltage	AC 120V/60Hz

RESULTS

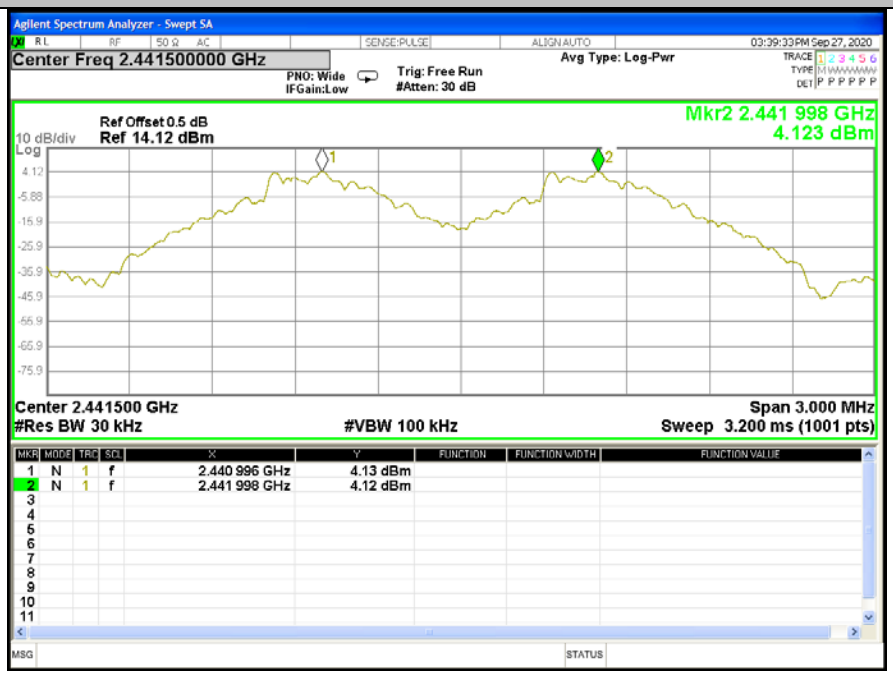
6.4.1. GFSK MODE

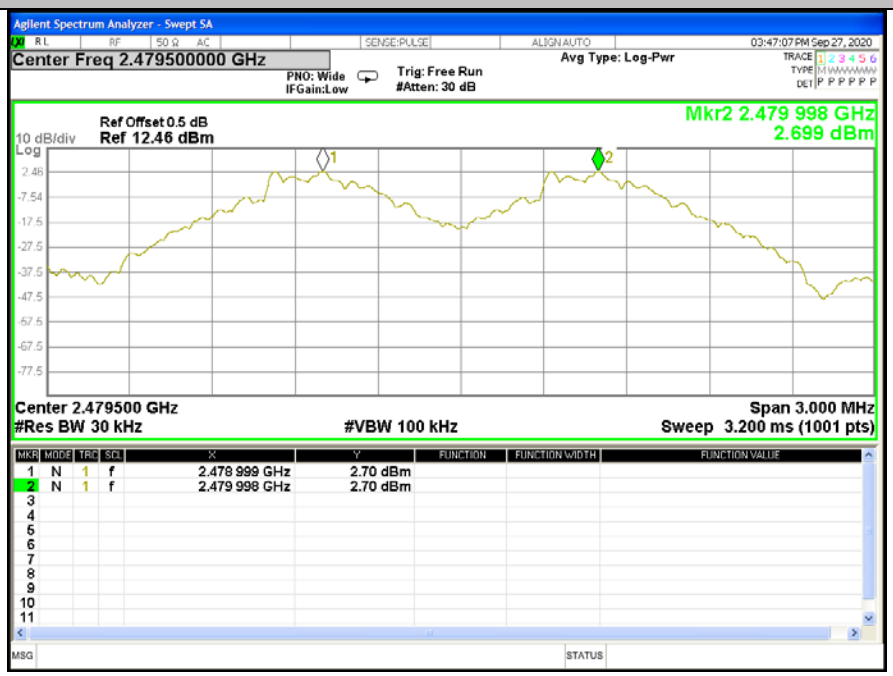
Channel	Carrier Hopping Channel Separation (MHz)	Limit (MHz)	Result
Low	0.999	≥ two-thirds of the 20 dB Bandwidth Of The Hopping Channel	PASS
Middle	1.002	≥ two-thirds of the 20 dB Bandwidth Of The Hopping Channel	PASS
High	0.999	≥ two-thirds of the 20 dB Bandwidth Of The Hopping Channel	PASS

CHANNEL SEPARATION LOW CH



This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

CHANNEL SEPARATION MID CH


CHANNEL SEPARATION HIGH CH


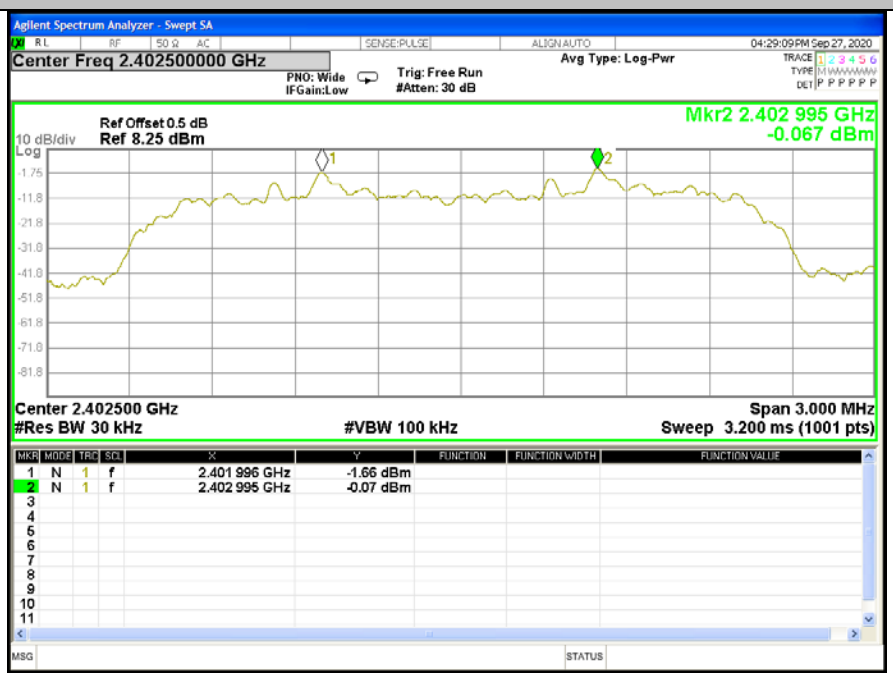
Note: For 20 dB Bandwidth of The Hopping Channel, please refer to clause 6.2.1.

This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

6.4.2. ∏/4-DQPSK MODE

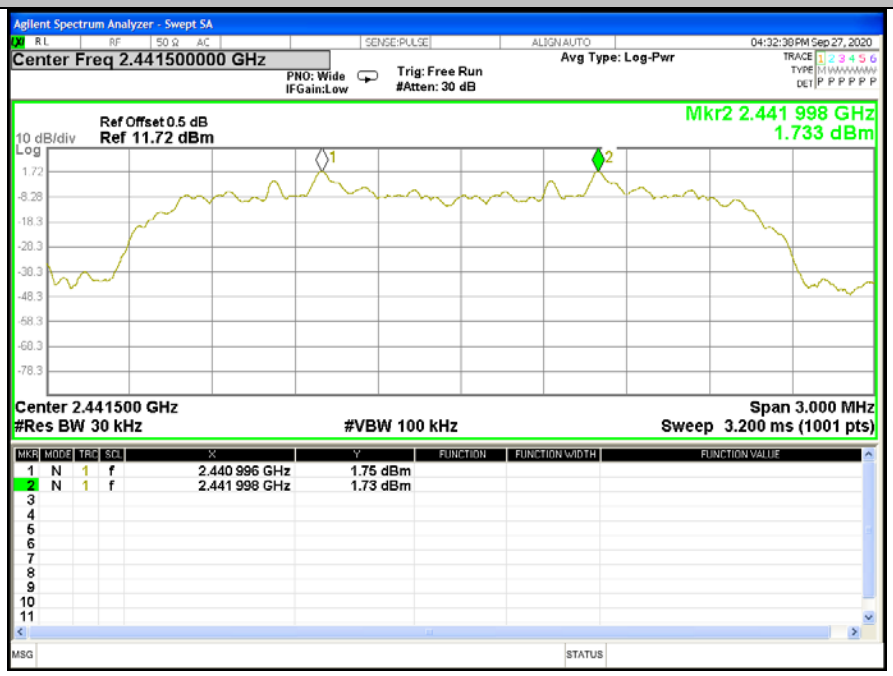
Channel	Carrier Hopping Channel Separation (MHz)	Limit (MHz)	Result
Low	0.999	≥ two-thirds of the 20 dB Bandwidth Of The Hopping Channel	PASS
Middle	1.002	≥ two-thirds of the 20 dB Bandwidth Of The Hopping Channel	PASS
High	0.999	≥ two-thirds of the 20 dB Bandwidth Of The Hopping Channel	PASS

CHANNEL SEPARATION LOW CH

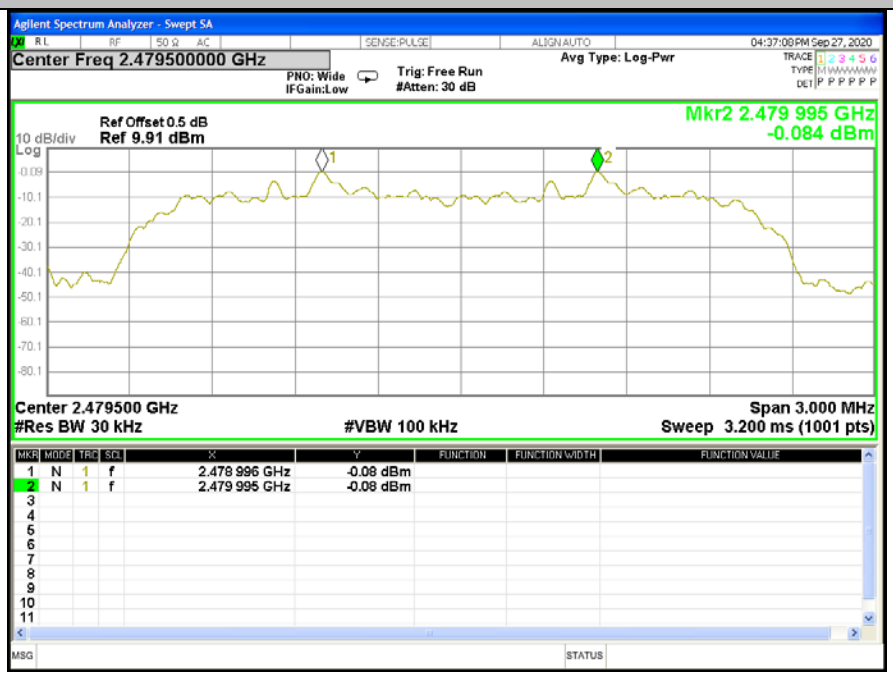


This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

CHANNEL SEPARATION MID CH



CHANNEL SEPARATION HIGH CH



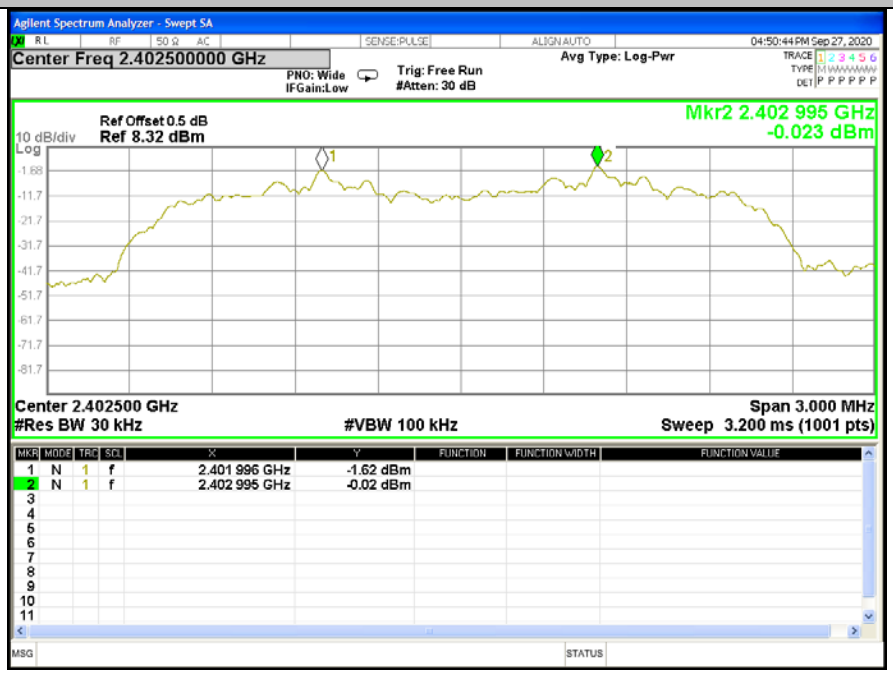
Note: For 20 dB Bandwidth of The Hopping Channel, please refer to clause 6.2.1.

This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

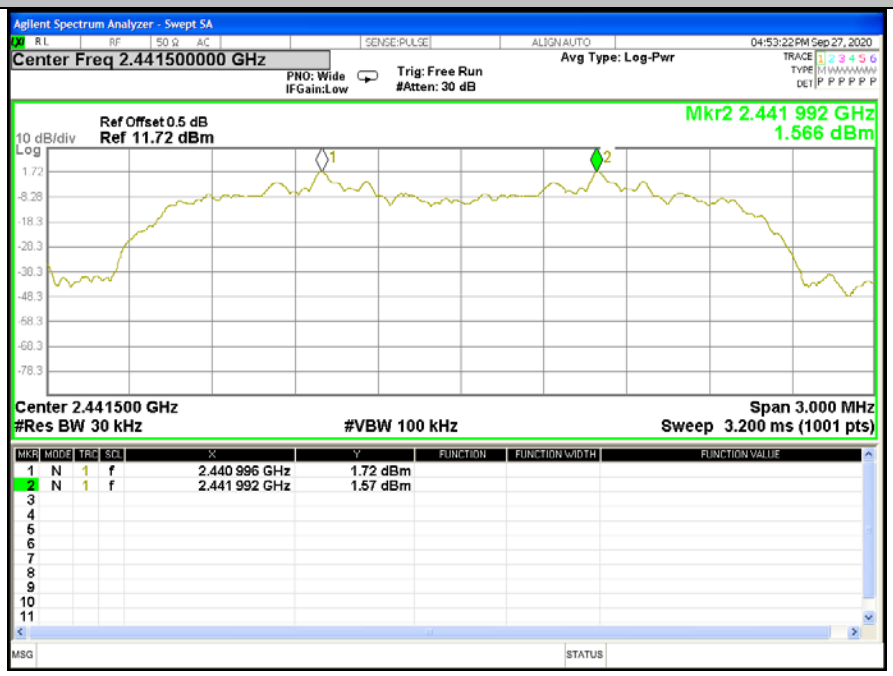
6.4.3. 8DPSK MODE

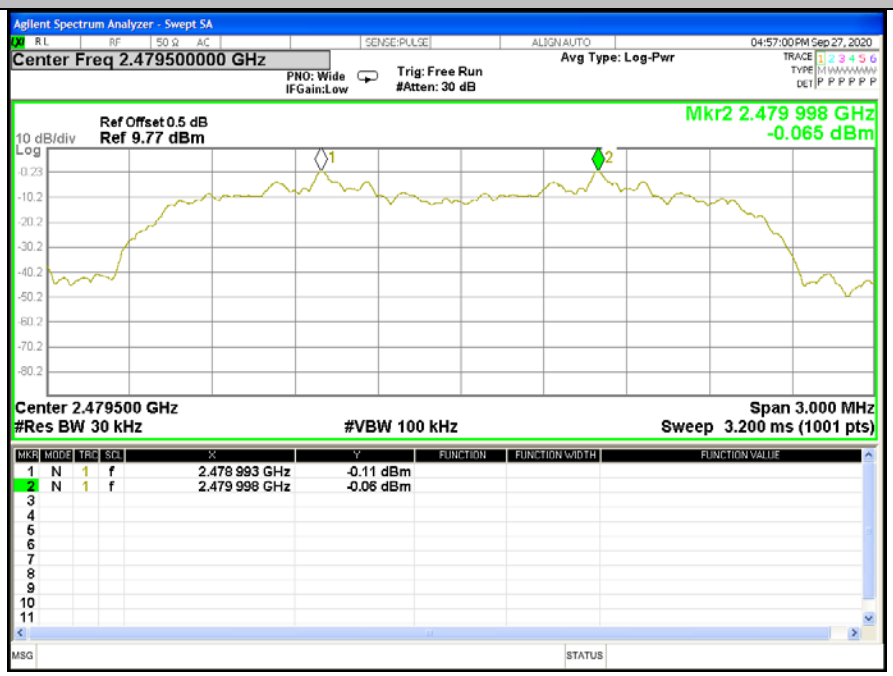
Channel	Carrier Hopping Channel Separation (MHz)	Limit (MHz)	Result
Low	0.999	≥ two-thirds of the 20 dB Bandwidth Of The Hopping Channel	PASS
Middle	0.996	≥ two-thirds of the 20 dB Bandwidth Of The Hopping Channel	PASS
High	1.005	≥ two-thirds of the 20 dB Bandwidth Of The Hopping Channel	PASS

CHANNEL SEPARATION LOW CH



This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

CHANNEL SEPARATION MID CH


CHANNEL SEPARATION HIGH CH


Note: For 20 dB Bandwidth of The Hopping Channel, please refer to clause 6.2.1.

This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

6.5. NUMBER OF HOPPING FREQUENCY

LIMITS

CFR 47 FCC Part15 (15.247) , Subpart C ISED RSS-247 ISSUE 2		
Section	Test Item	Limit
CFR 47 15.247 (a) (1) III ISED RSS-247 Clause 5.1 (d)	Number of Hopping Frequency	at least 15 hopping channels

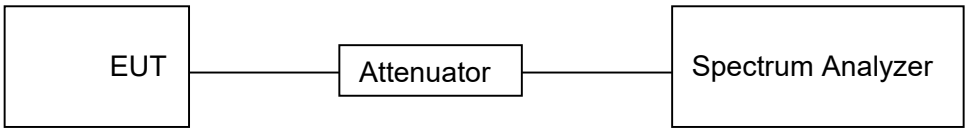
TEST PROCEDURE

Connect the EUT to the spectrum Analyzer and use the following settings:

Detector	Peak
RBW	To identify clearly the individual channels, set the RBW to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller.
VBW	≥RBW
Span	The frequency band of operation
Trace	Max hold
Sweep time	Auto couple

Set EUT to transmit maximum output power and switch on frequency hopping function. then set enough count time (larger than 5000 times) to get all the hopping frequency channel displayed on the screen of spectrum analyzer.
Count the quantity of peaks to get the number of hopping channels.
FHSS Mode: 79 Channels observed.
AFHSS Mode: 20 Channels declared.

TEST SETUP



TEST ENVIRONMENT

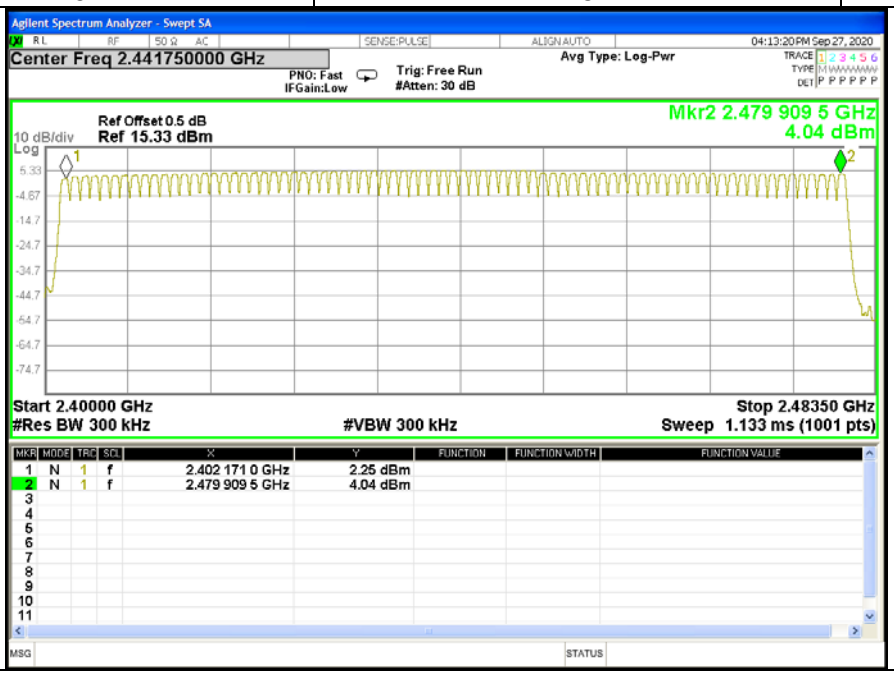
Temperature	23.2°C	Relative Humidity	52 %
Atmosphere Pressure	101 kPa	Test Voltage	AC 120V/60Hz

This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

RESULTS

6.5.1. GFSK MODE

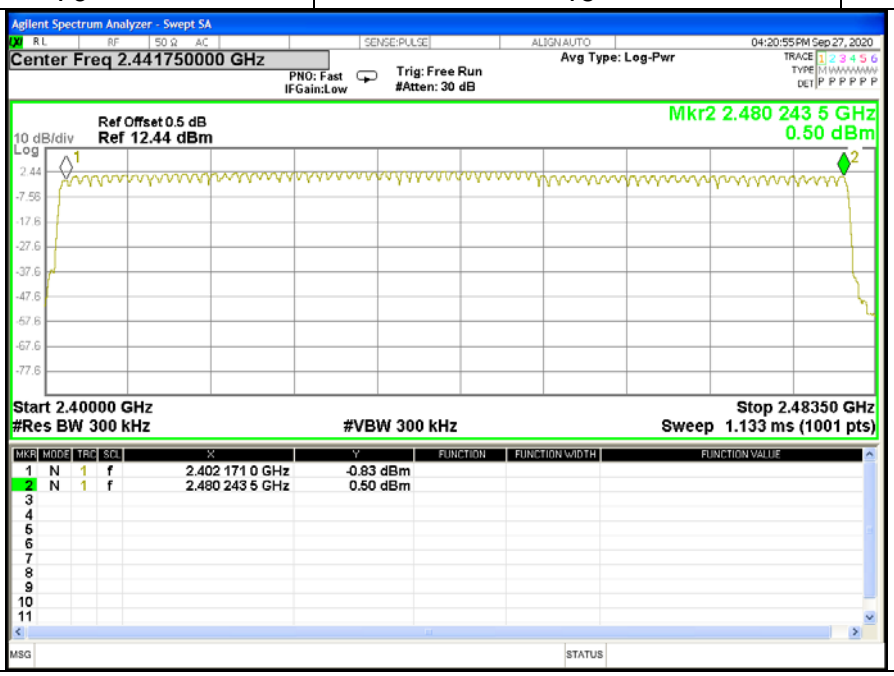
Hopping numbers	Limit	Results
79	>15	Pass



This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

6.5.2. ∏/4-DQPSK MODE

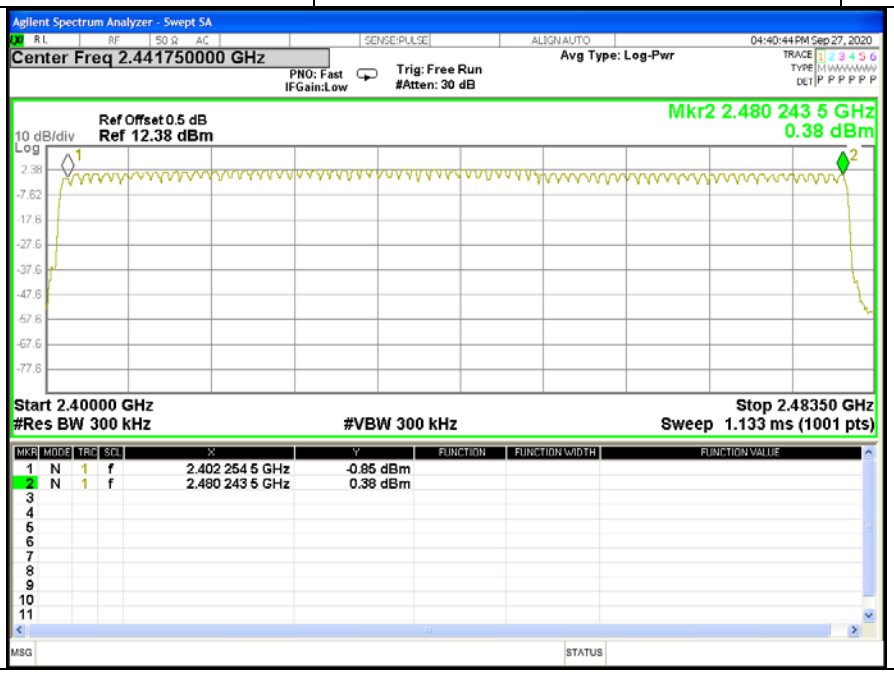
Hopping numbers	Limit	Results
79	>15	Pass



This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

6.5.3. 8DPSK MODE

Hopping numbers	Limit	Results
79	>15	Pass



This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

6.6. TIME OF OCCUPANCY (DWELL TIME)

LIMITS

CFR 47 FCC Part15 (15.247) , Subpart C ISED RSS-247 ISSUE 2		
Section	Test Item	Limit
CFR 47 15.247 (a) (1) III ISED RSS-247 Clause 5.1 (d)	Time of Occupancy (Dwell Time)	The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds, multiplied by the number of hopping channels employed.

TEST PROCEDURE

Connect the UUT to the spectrum Analyzer and use the following settings:

Center Frequency	The center frequency of the channel under test
Detector	Peak
RBW	1 MHz
VBW	≥RBW
Span	zero span
Trace	Max hold
Sweep time	As necessary to capture the entire dwell time per hopping channel

a. The transmitter output (antenna port) was connected to the spectrum analyzer
b. Set RBW of spectrum analyzer to 1MHz and VBW to 1MHz.
c. Use a video trigger with the trigger level set to enable triggering only on full pulses.
d. Sweep Time is more than once pulse time.
e. Set the center frequency on any frequency would be measure and set the frequency span to zero span.
f. Measure the maximum time duration of one single pulse.
g. Set the EUT for DH5, DH3 and DH1 packet transmitting.
h. Measure the maximum time duration of one single pulse.

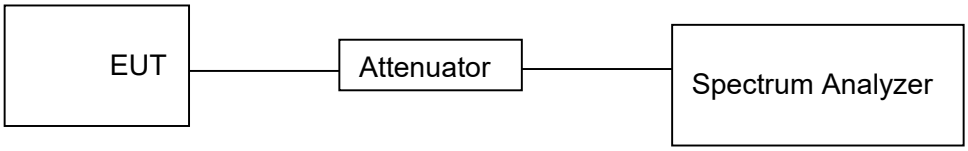
A Period Time = (channel number)*0.4

For FHSS Mode (79 Channel):
DH1 Time Slot: Reading * (1600/2)*31.6/(channel number)
DH3 Time Slot: Reading * (1600/4)*31.6/(channel number)
DH5 Time Slot: Reading * (1600/6)*31.6/(channel number)

For AFHSS Mode (20 Channel):
DH1 Time Slot: Reading * (1600/2)*8/(channel number)
DH3 Time Slot: Reading * (1600/4)*8/(channel number)
DH5 Time Slot: Reading * (1600/6)*8/(channel number)

This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

TEST SETUP



TEST ENVIRONMENT

Temperature	23.2°C	Relative Humidity	52 %
Atmosphere Pressure	101 kPa	Test Voltage	AC 120V/60Hz

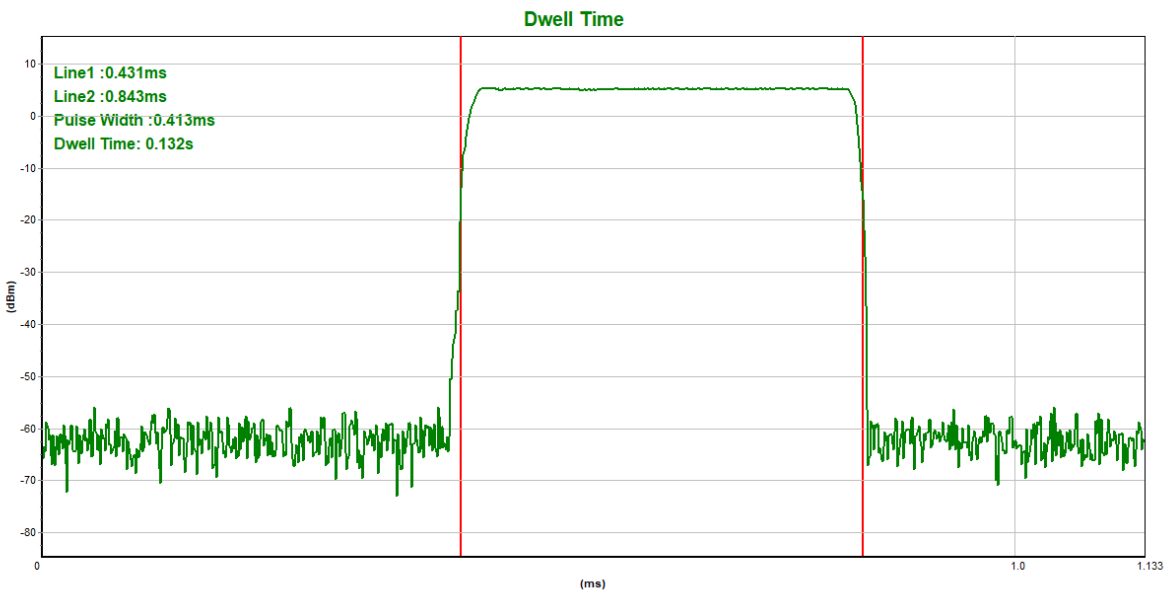
6.6.1. GFSK MODE

RESULTS TABLE

Modulation	Data Packet	Channel	pulse time(ms)	Dwell Time(s)	Limits(s)
GFSK	DH1	middle	0.413	0.132	0.4
	DH3	middle	1.662	0.266	0.4
	DH5	middle	2.920	0.311	0.4

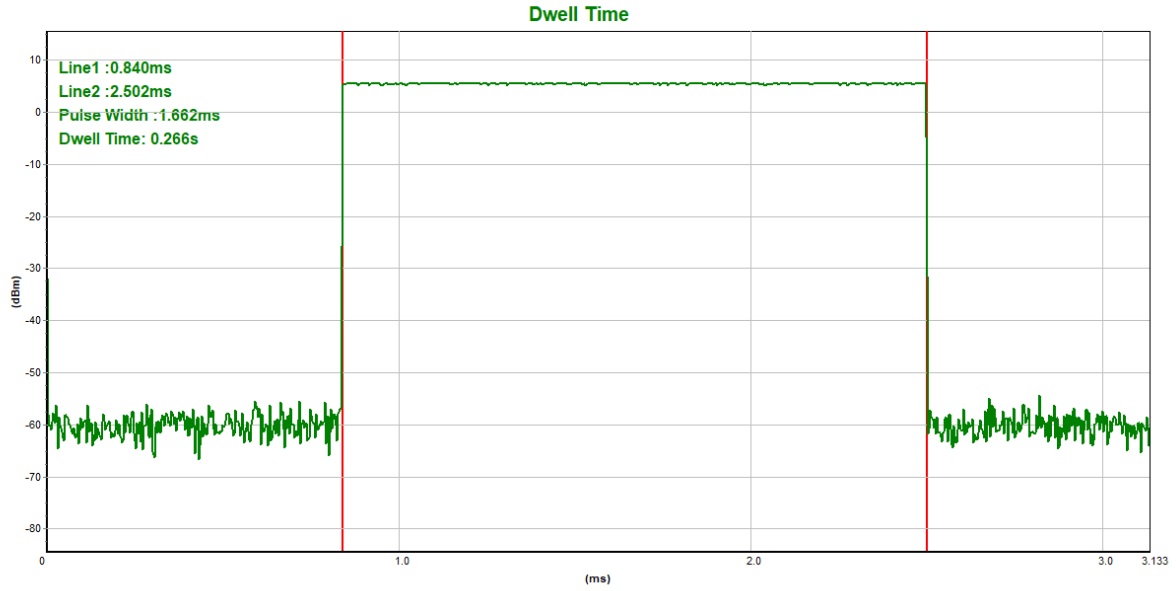
TEST GRAPHS

TIME OF SINGLE SLOT(DH1)

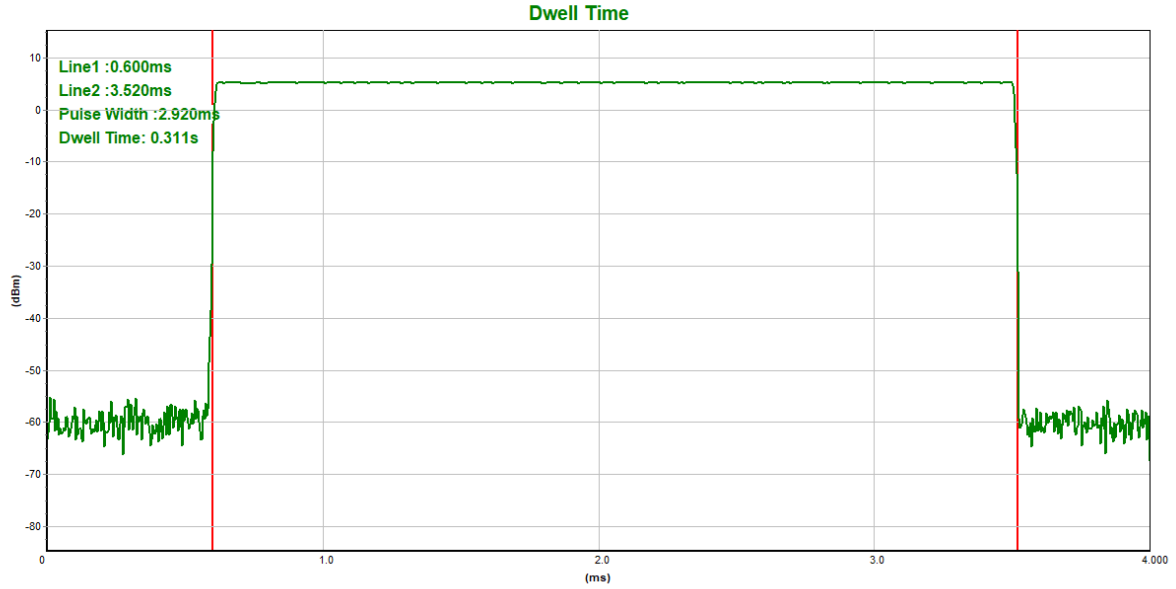


This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

TIME OF SINGLE SLOT(DH3)



TIME OF SINGLE SLOT(DH5)



This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

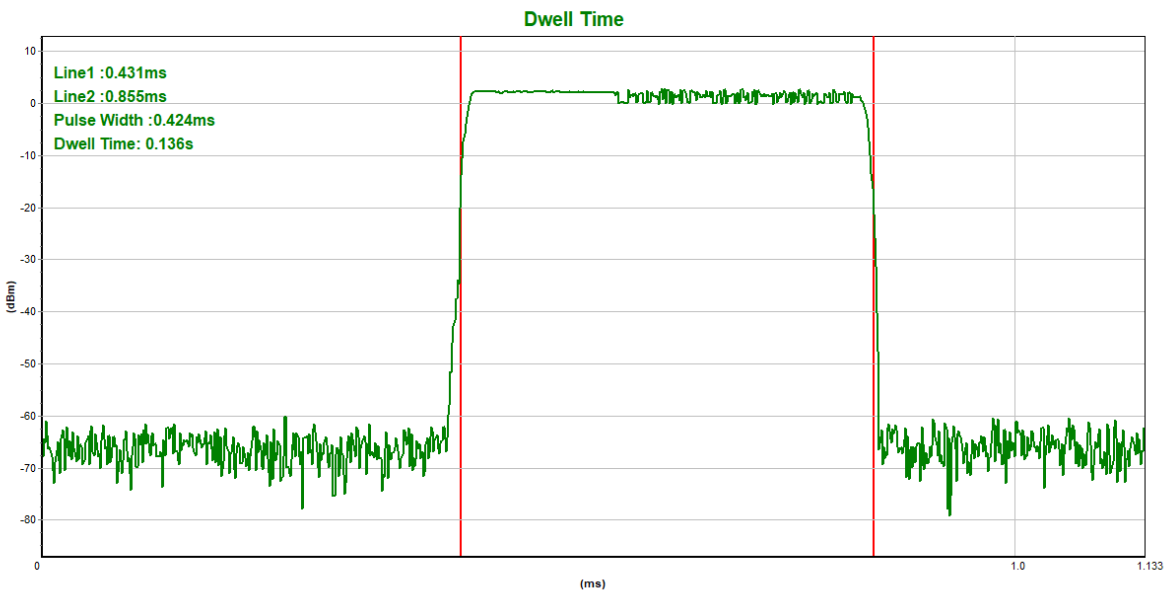
6.6.2. π /4-DQPSK MODE

RESULTS TABLE

Modulation	Data Packet	Channel	pulse time(ms)	Dwell Time(s)	Limits(s)
π /4-DQPSK	2DH1	middle	0.424	0.136	0.4
	2DH3	middle	1.665	0.266	0.4
	2DH5	middle	2.924	0.312	0.4

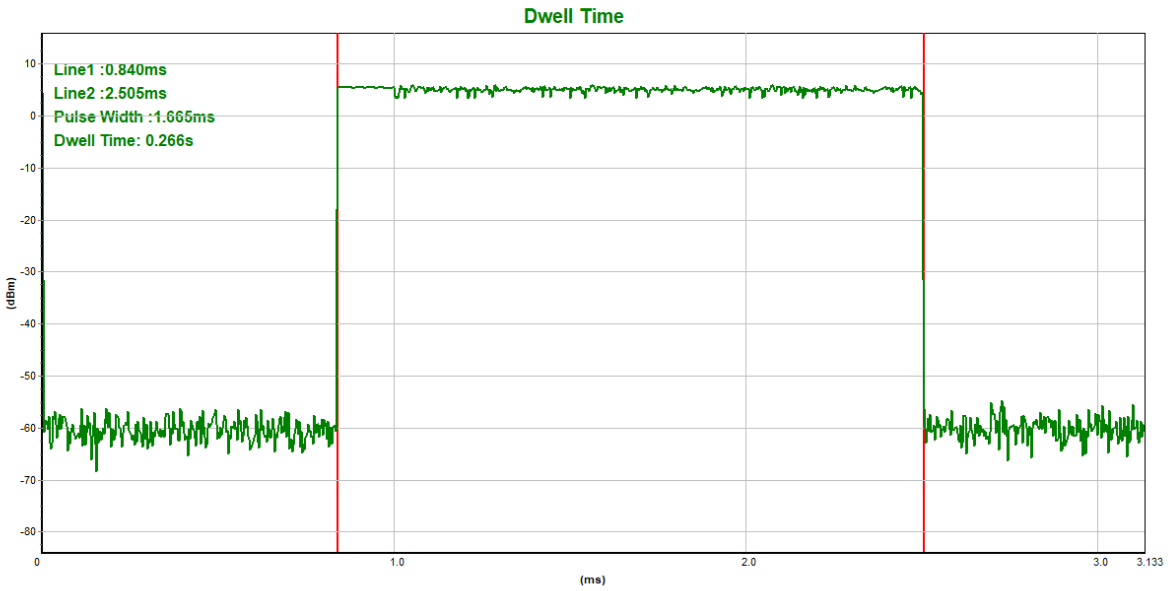
TEST GRAPHS

TIME OF SINGLE SLOT(2DH1)

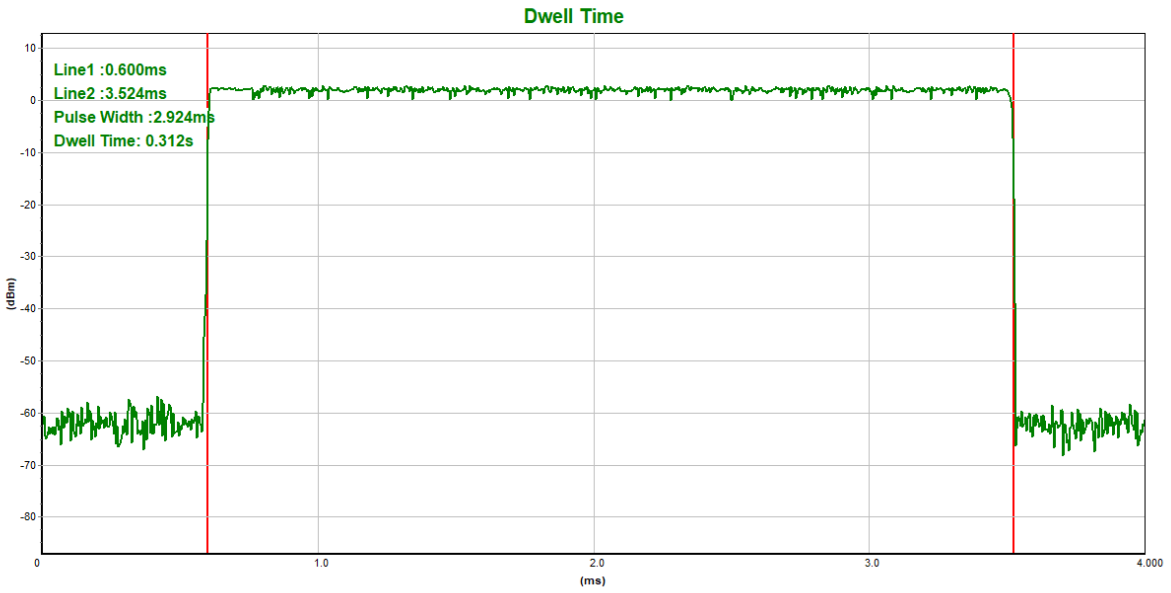


This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

TIME OF SINGLE SLOT(2DH3)



TIME OF SINGLE SLOT(2DH5)



This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

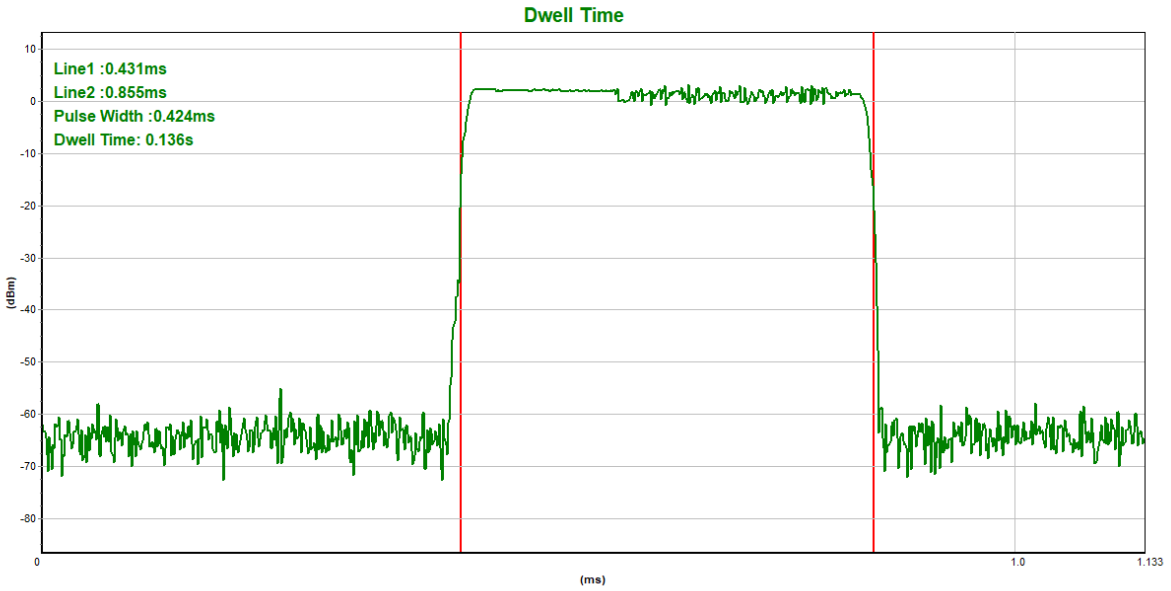
6.6.3. 8DPSK MODE

RESULTS TABLE

Modulation	Data Packet	Channel	pulse time(ms)	Dwell Time(s)	Limits(s)
8DPSK	3DH1	middle	0.424	0.136	0.4
	3DH3	middle	1.665	0.266	0.4
	3DH5	middle	2.928	0.312	0.4

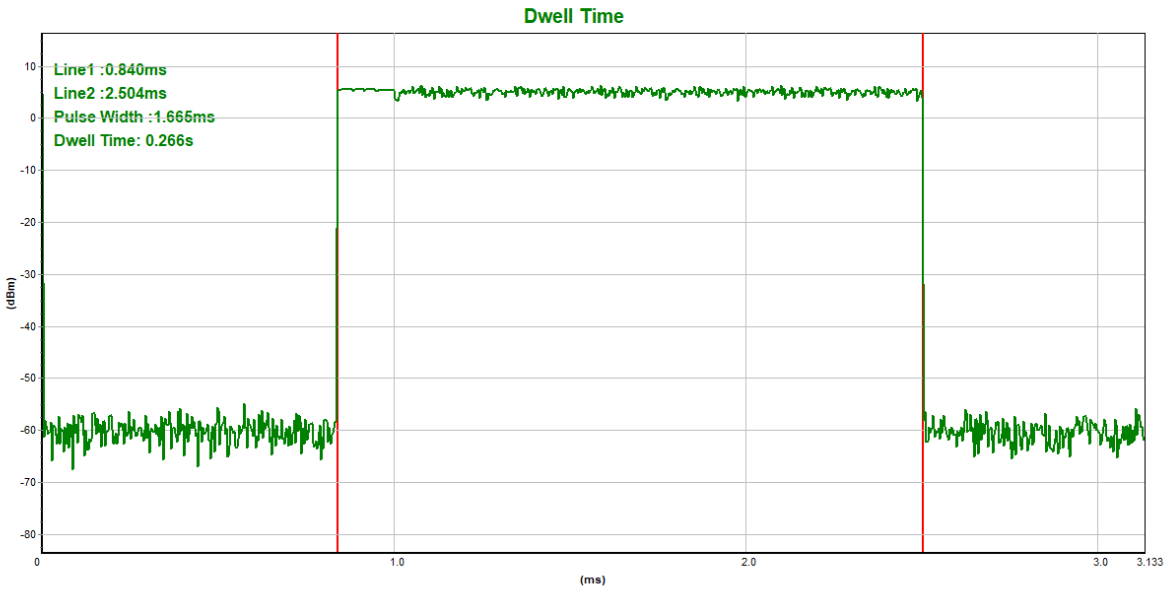
TEST GRAPHS

TIME OF SINGLE SLOT(3DH1)

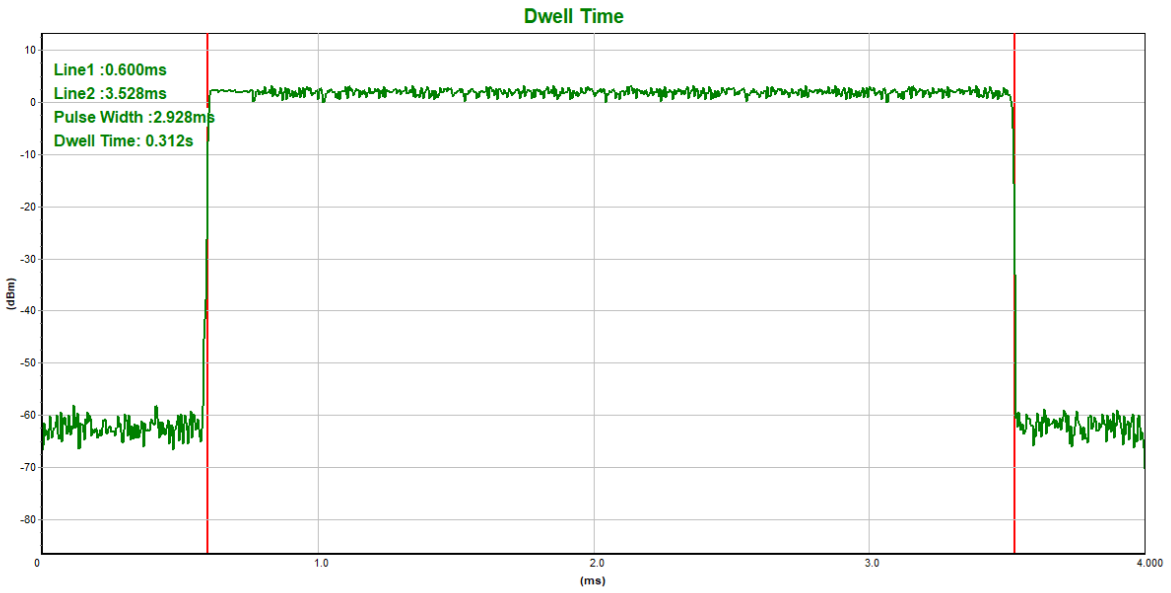


This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

TIME OF SINGLE SLOT(3DH3)



TIME OF SINGLE SLOT(3DH5)



This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

6.7. CONDUCTED BANDEDGE AND SPURIOUS EMISSION

LIMITS

CFR 47 FCC Part15 (15.247) , Subpart C ISED RSS-247 ISSUE 2		
Section	Test Item	Limit
CFR 47 FCC §15.247 (d) ISED RSS-247 5.5	Conducted Spurious Emission	at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power

TEST PROCEDURE

Please refer to the ANSI C63.10 section 6.10.

For Bandedge use the following settings:

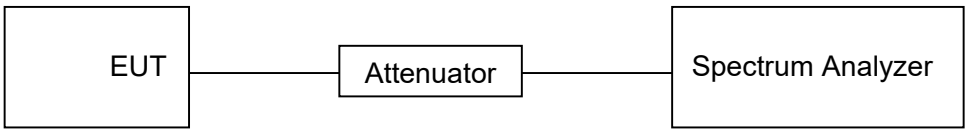
Detector	Peak
RBW	100kHz
VBW	300kHz
Span	wide enough to fully capture the emission being measured
Trace	Max hold
Sweep time	Auto couple.

For Spurious Emission use the following settings:

Detector	Peak
RBW	100kHz
VBW	300kHz
Span	wide enough to fully capture the emission being measured
Trace	Max hold
Sweep time	Auto couple.

Use the peak marker function to determine the maximum amplitude level.

TEST SETUP



TEST ENVIRONMENT

Temperature	23.2°C	Relative Humidity	52 %
Atmosphere Pressure	101 kPa	Test Voltage	AC 120V/60Hz

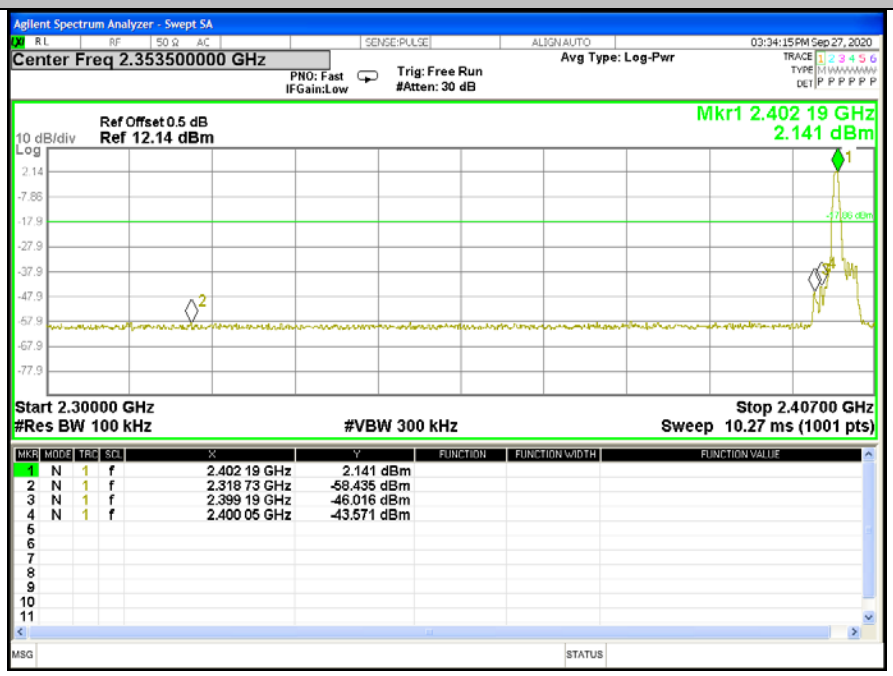
This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

6.7.1. GFSK MODE

Part I :CONDUCTED BANDEDGE

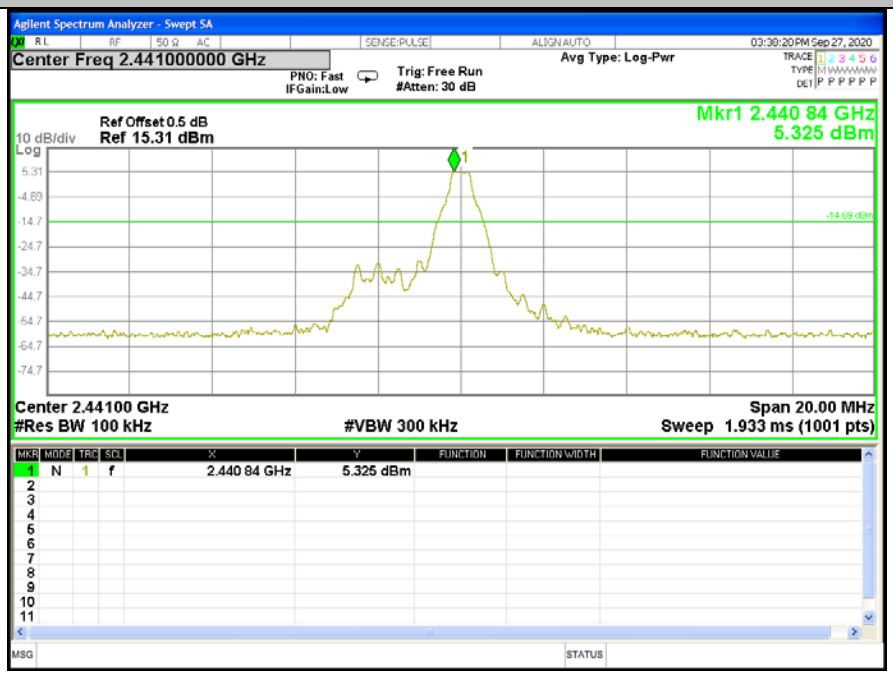
TEST GRAPHS

CONDUCTED BANDEDGE, LOW CHANNEL

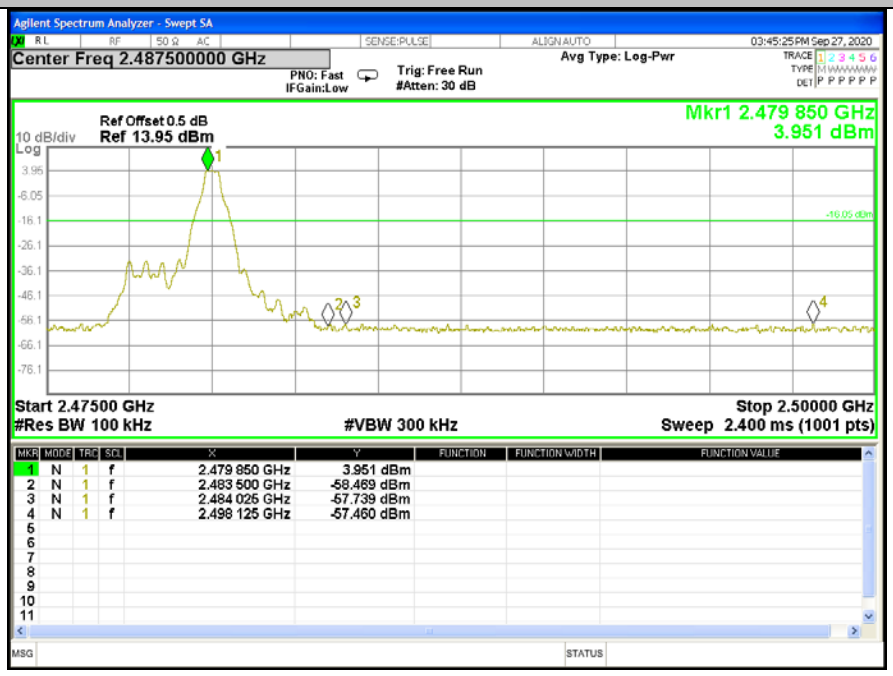


This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

CONDUCTED BANDEDGE, MID CHANNEL



CONDUCTED BANDEDGE, HIGH CHANNEL

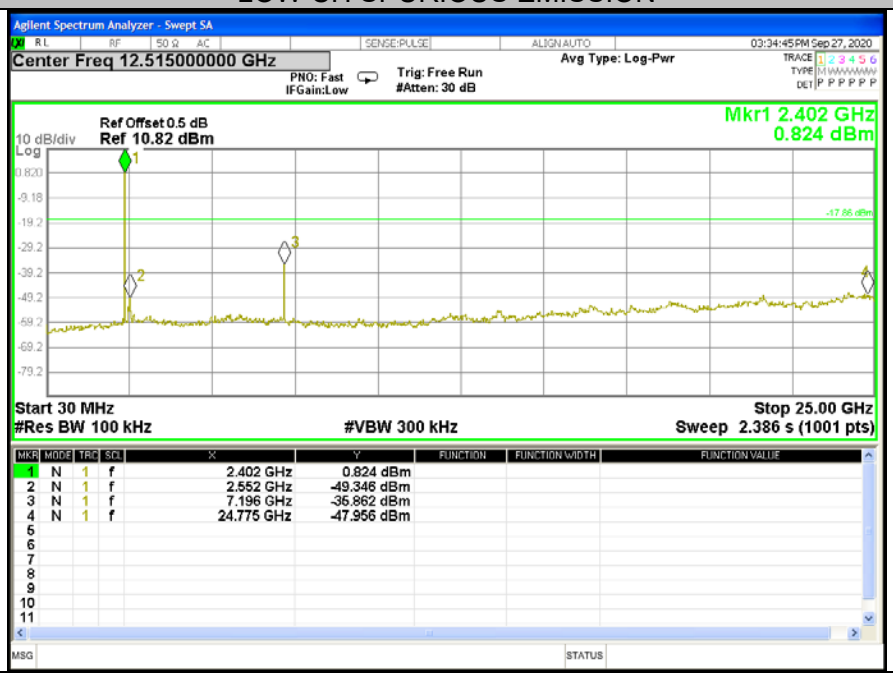


This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

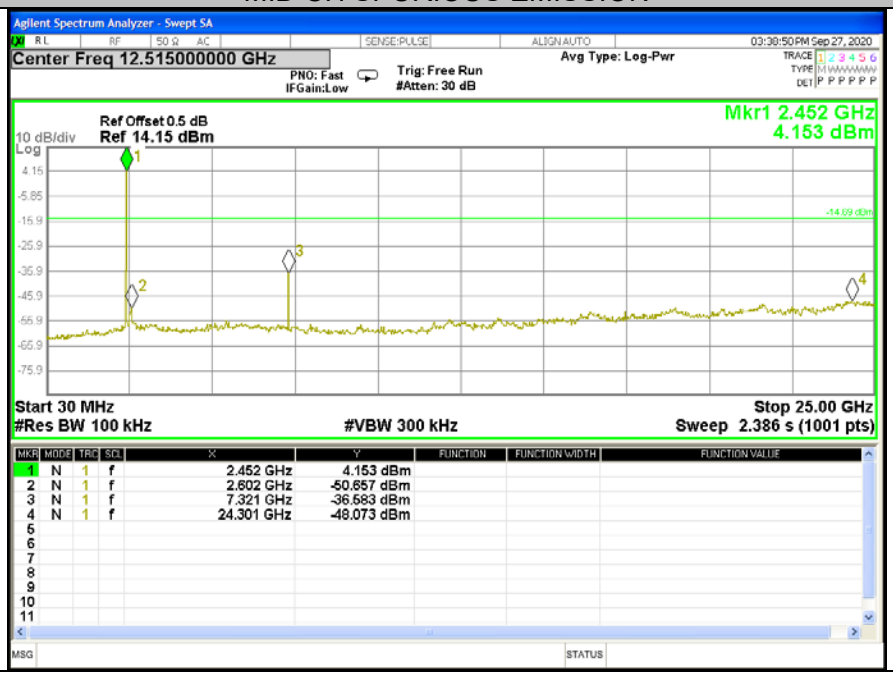
Part II :CONDUCTED SPURIOUS EMISSION

TEST GRAPHS

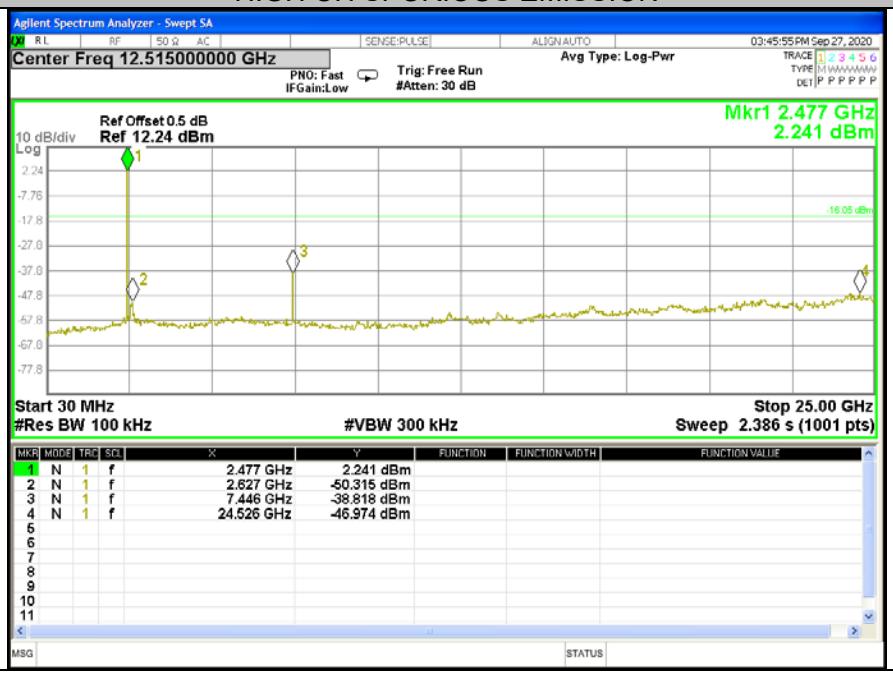
LOW CH SPURIOUS EMISSION



MID CH SPURIOUS EMISSION



This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

HIGH CH SPURIOUS EMISSION


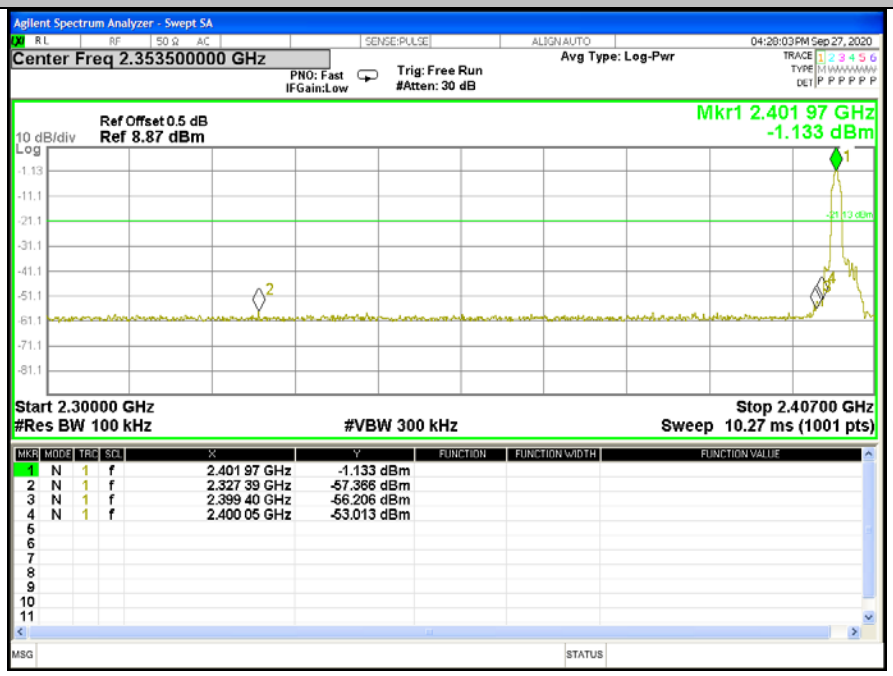
This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

6.7.2. π /4-DQPSK MODE

Part I :CONDUCTED BANDEDGE

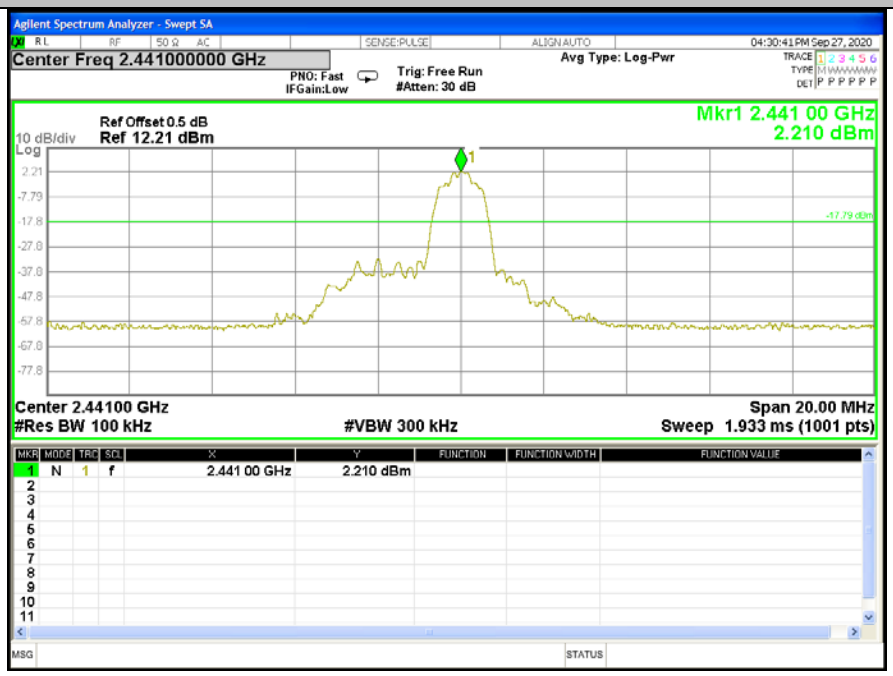
TEST GRAPHS

CONDUCTED BANDEDGE, LOW CHANNEL

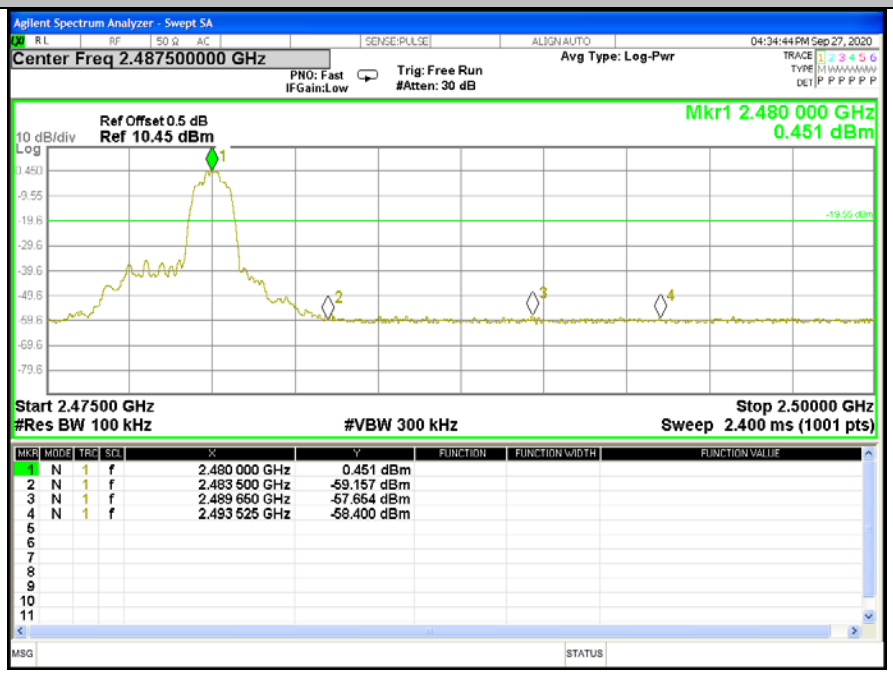


This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

CONDUCTED BANDEDGE, MID CHANNEL



CONDUCTED BANDEDGE, HIGH CHANNEL



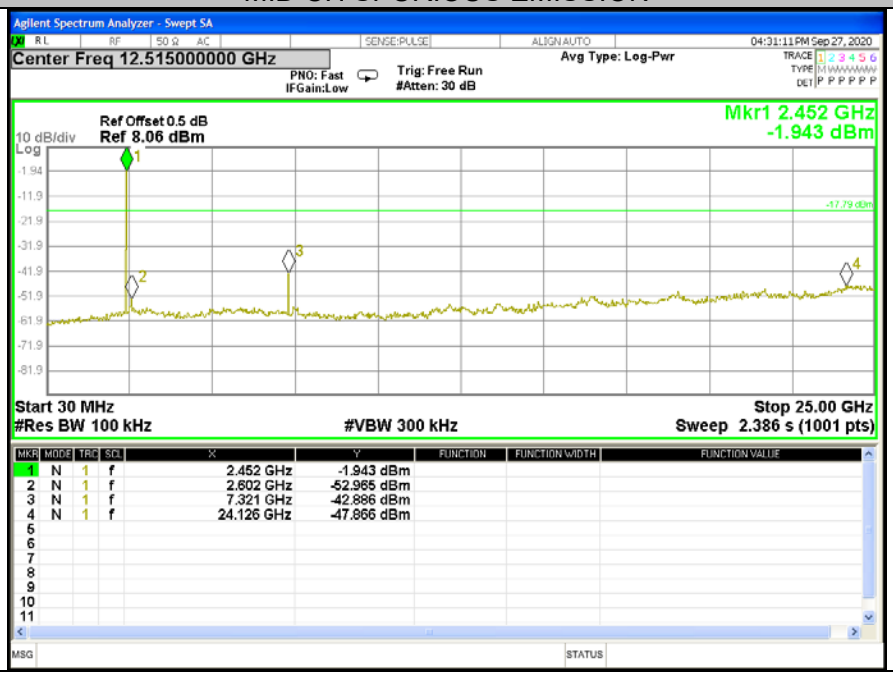
This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

Part II :CONDUCTED SPURIOUS EMISSION

TEST GRAPHS

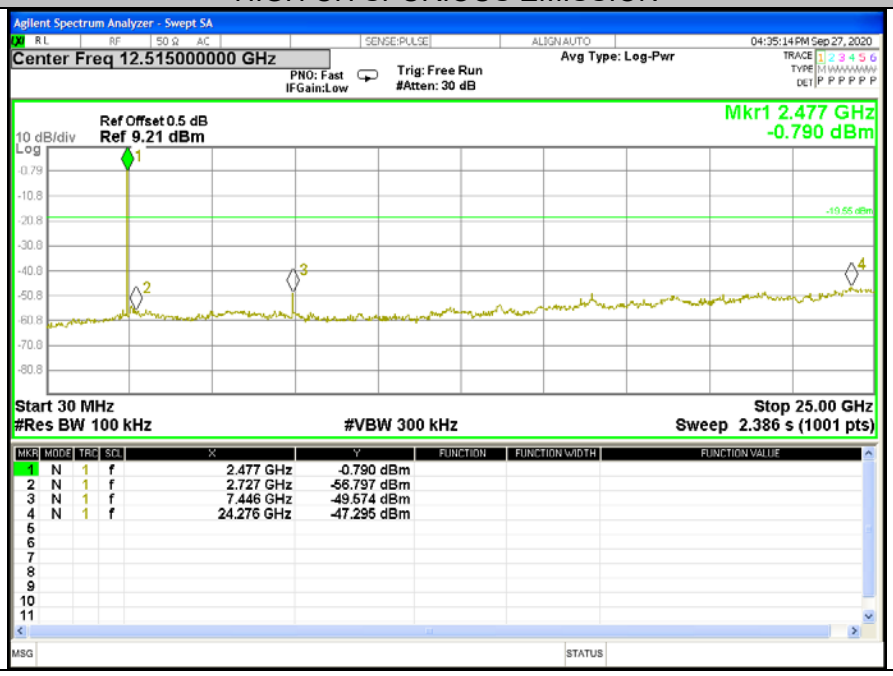
LOW CH SPURIOUS EMISSION

MID CH SPURIOUS EMISSION



This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

HIGH CH SPURIOUS EMISSION

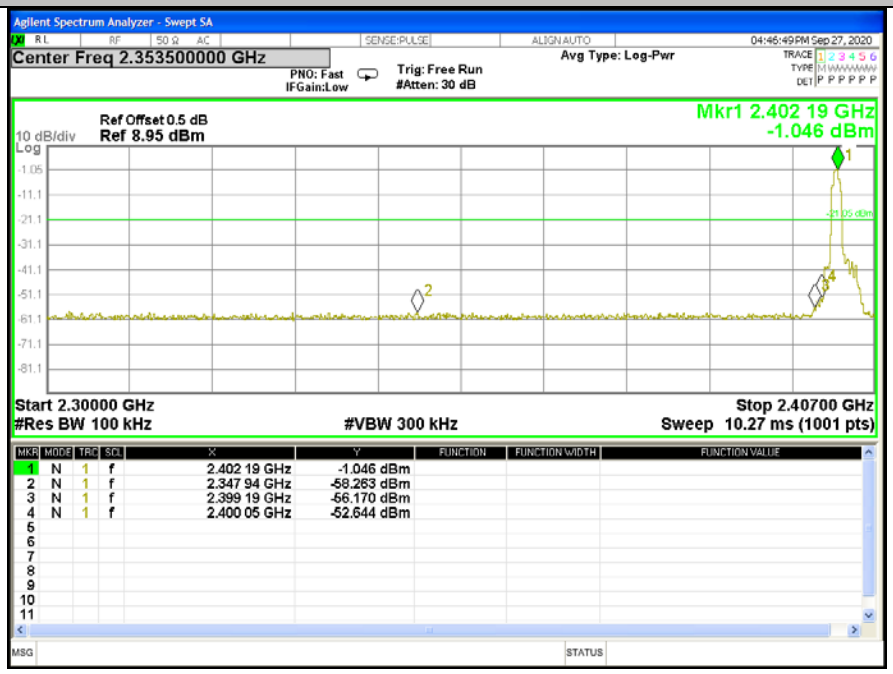


This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

6.7.3. 8DPSK MODE

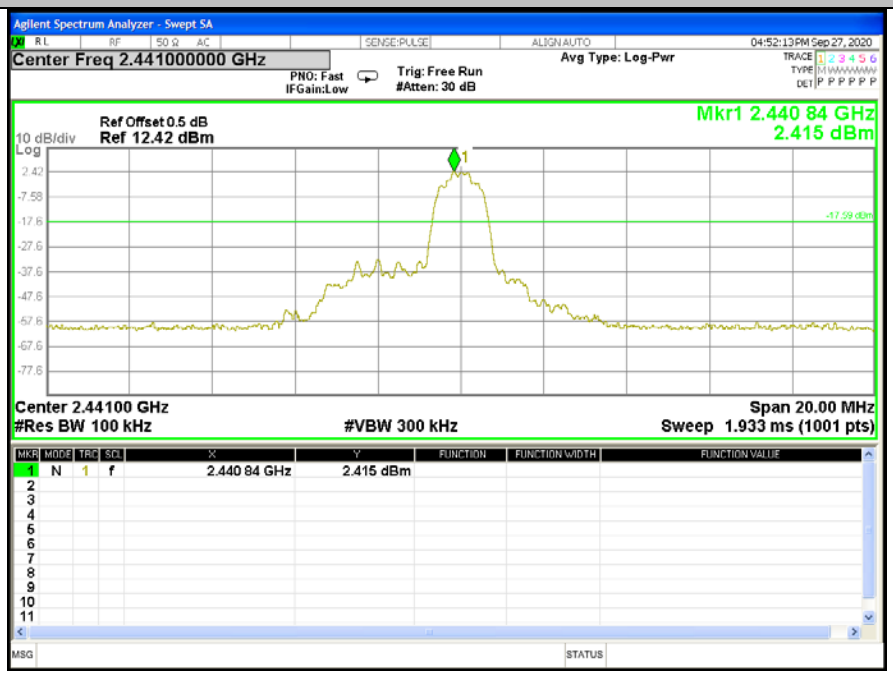
Part I :CONDUCTED BANDEDGE

RESULTS TABLE

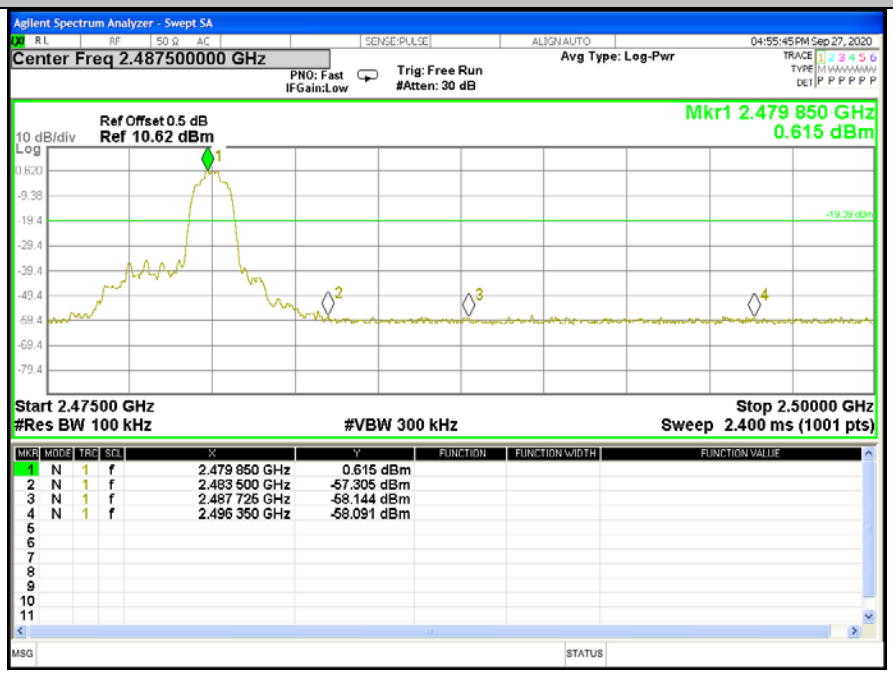
CONDUCTED BANDEDGE, LOW CHANNEL


This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

CONDUCTED BANDEDGE, MID CHANNEL



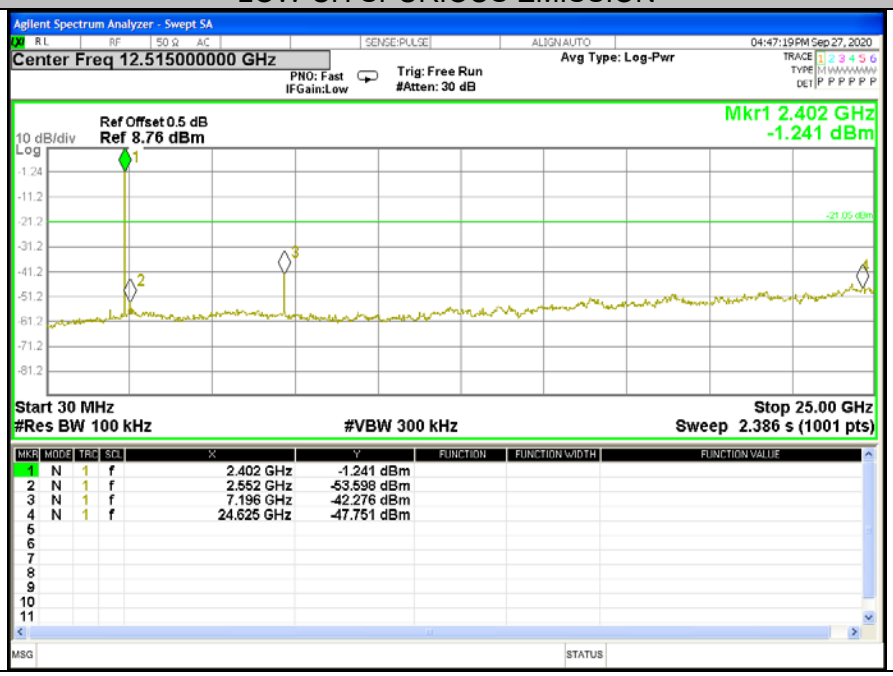
CONDUCTED BANDEDGE, HIGH CHANNEL



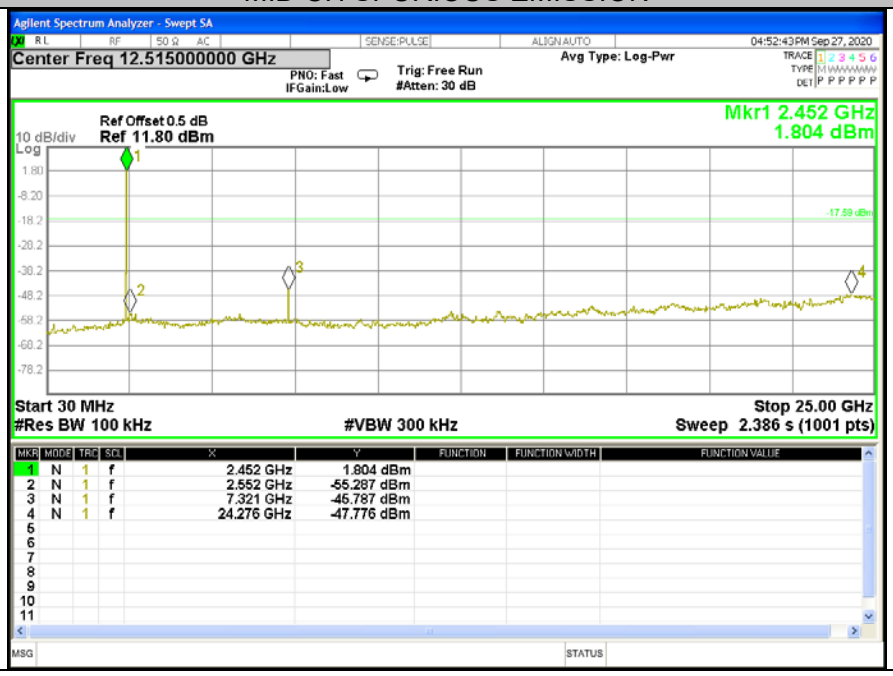
This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

Part II : CONDUCTED SPURIOUS EMISSION

LOW CH SPURIOUS EMISSION

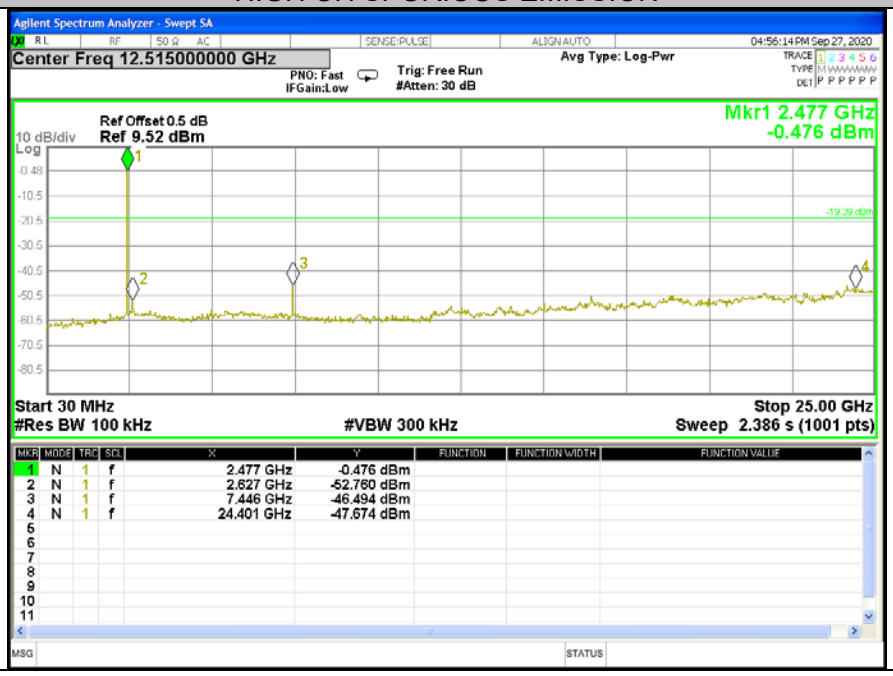


MID CH SPURIOUS EMISSION



This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

HIGH CH SPURIOUS EMISSION



This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

7. RADIATED TEST RESULTS

7.1. LIMITS AND PROCEDURE

LIMITS

Please refer to CFR 47 FCC §15.205 and §15.209

Please refer to ISED RSS-GEN Clause 8.9 and Clause 8.10

Radiation Disturbance Test Limit for FCC (9kHz-1GHz)

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(kHz)	300
0.490~1.705	24000/F(kHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
960~1000	500	3

Radiation Disturbance Test Limit for IC (Below 30MHz)

Frequency (MHz)	Field Strength (μA/m)	Measurement Distance (meters)
0.009~0.490	6.37/F(kHz)	300
0.490~1.705	63.7/F(kHz)	30
1.705~30.0	0.08	30

Radiation Disturbance Test Limit for IC (Above 30MHz)

Frequency (MHz)	Field Strength (μV/m)	Measurement Distance (meters)
30~88	100	3
88~216	150	3
216~960	200	3
960~1000	500	3

Note: 1) At frequencies at or above 30 MHz, measurements may be performed at a distance other than what is specified provided: measurements are not made in the near field except where it can be shown that near field measurements are appropriate due to the characteristics of the device; and it can be demonstrated that the signal levels needed to be measured at the distance employed can be detected by the measurement equipment. Measurements shall not be performed at a distance greater than 30 meters unless it can be further demonstrated that measurements at a distance of 30 meters or less are impractical. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse linear-distance for field strength measurements; inverse-linear-distance-squared for power density measurements).

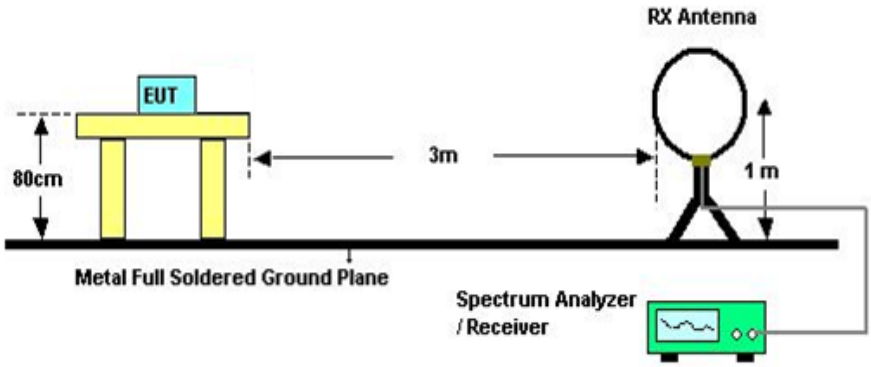
This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

(2) At frequencies below 30 MHz, measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field. Pending the development of an appropriate measurement procedure for measurements performed below 30 MHz, when performing measurements at a closer distance than specified, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade). This paragraph (f) shall not apply to Access BPL devices operating below 30 MHz.

Radiation Disturbance Test Limit for FCC&IC (Above 1G)

Frequency (MHz)	dB(uV/m) (at 3 meters)	
	Peak	Average
Above 1000	74	54

About Restricted bands of operation please refer to RSS-Gen section 8.10 and FCC §15.205 (a)
TEST SETUP AND PROCEDURE
Below 30MHz



The setting of the spectrum Analyzer

RBW	200Hz (From 9kHz to 0.15MHz)/ 9kHz	(From 0.15MHz to 30MHz)
VBW	200Hz (From 9kHz to 0.15MHz)/ 9kHz	(From 0.15MHz to 30MHz)
Sweep	Auto	
Trace	Max hold	

1. The testing follows the guidelines in ANSI C63.10-2013

2. The EUT was arranged to its worst case and then turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

3. The EUT was placed on a turntable with 80cm meter above ground.

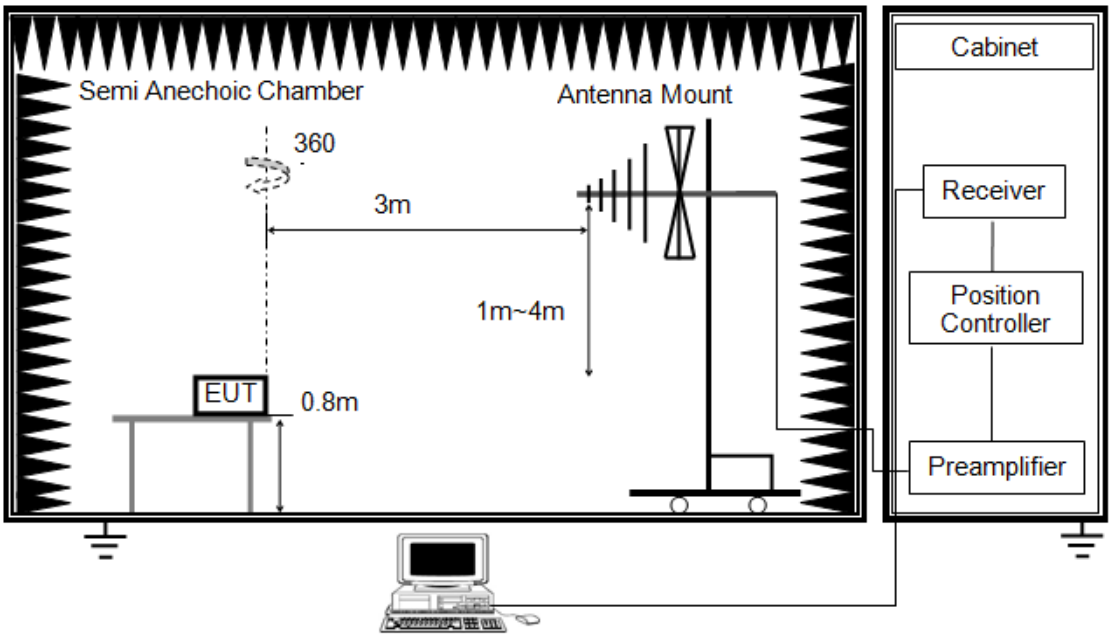
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.

This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

5. The radiated emission limits are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

6. For measurement below 1GHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured. If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.

7. Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30m open are test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.
Below 1G and above 30MHz



The setting of the spectrum Analyzer

RBW	120K
VBW	300K
Sweep	Auto
Trace	Max hold

1. The testing follows the guidelines in ANSI C63.10-2013.

2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

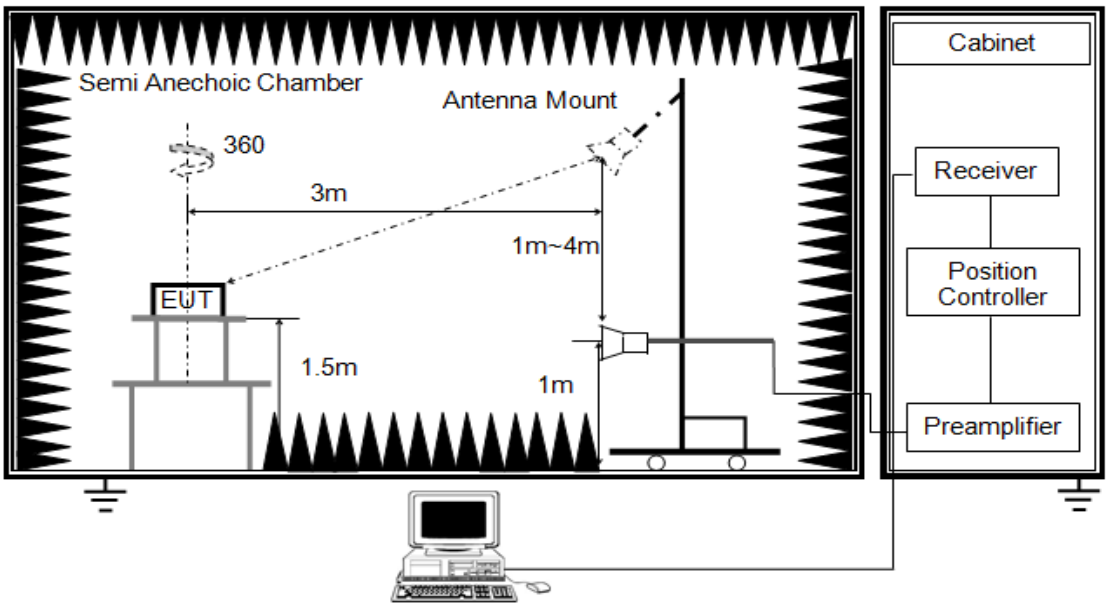
This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

3. The EUT was placed on a turntable with 80cm above ground.

4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.

5. For measurement below 1GHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured. If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.

Above 1G



RBW	1M
VBW	PEAK: 3M AVG: see note 6
Sweep	Auto
Detector	Peak
Trace	Max hold

1. The testing follows the guidelines in ANSI C63.10-2013.

2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

3. The EUT was placed on a turntable with 80cm above ground.

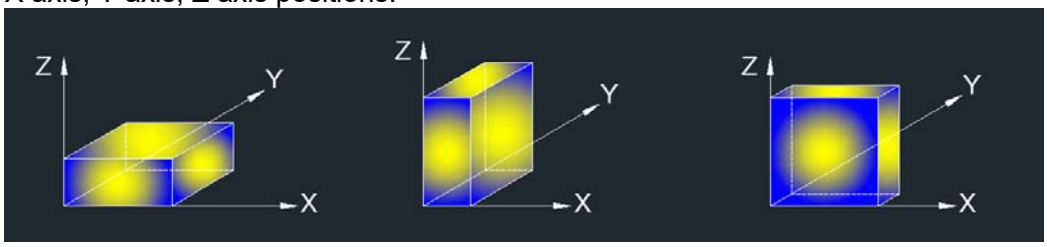
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.

This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

5. For measurement above 1GHz, the emission measurement will be measured by the peak detector. This peak level, once corrected, must comply with the limit specified in Section 15.209.

6. For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 3 MHz for peak measurements and 1 MHz resolution bandwidth with 1/T video bandwidth with peak detector. For the Duty Cycle please refer to clause 6.1.ON TIME AND DUTY CYCLE.

X axis, Y axis, Z axis positions:



Note 1: For all radiated test, EUT in each of three orthogonal axis emissions had been tested, but only the worst case (X axis) data recorded in the report.

Note 2: The EUT was fully exercised with external accessories during the test. In the case of multiple accessory external ports, an external accessory shall be connected to one of each type of port.

TEST ENVIRONMENT

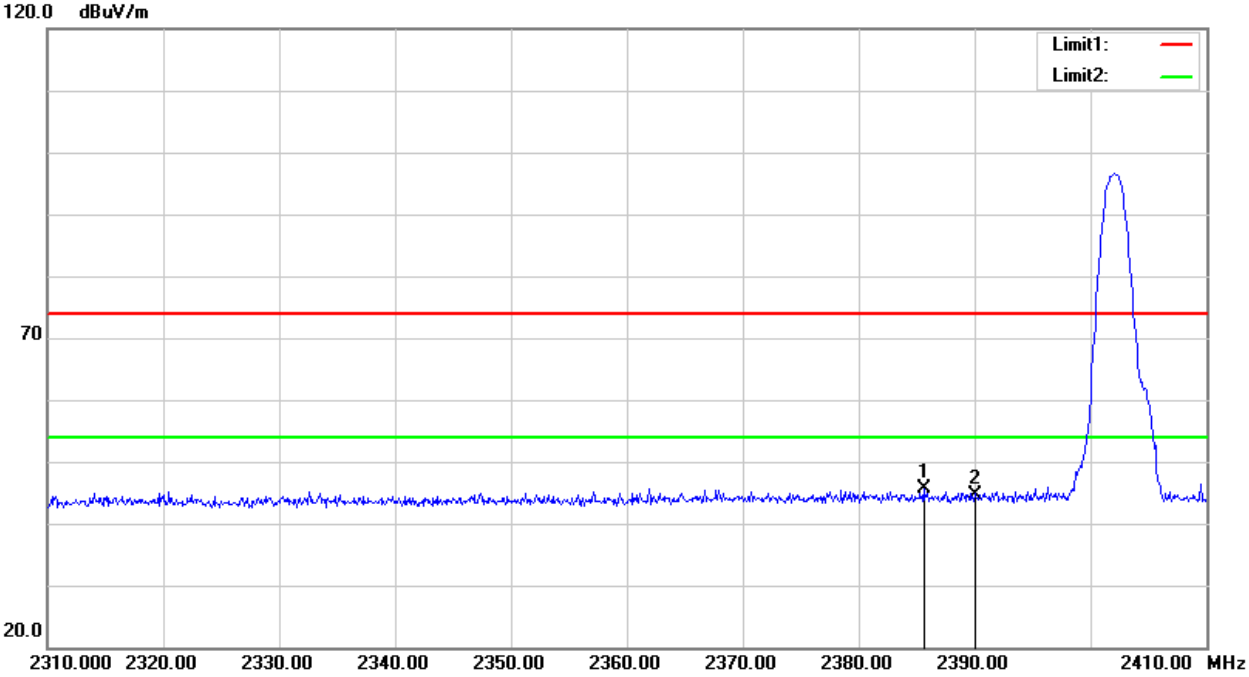
Temperature	23.2°C	Relative Humidity	52 %
Atmosphere Pressure	101 kPa	Test Voltage	AC 120V/60Hz

This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

7.2. RESTRICTED BANDEDGE

7.2.1. GFSK MODE

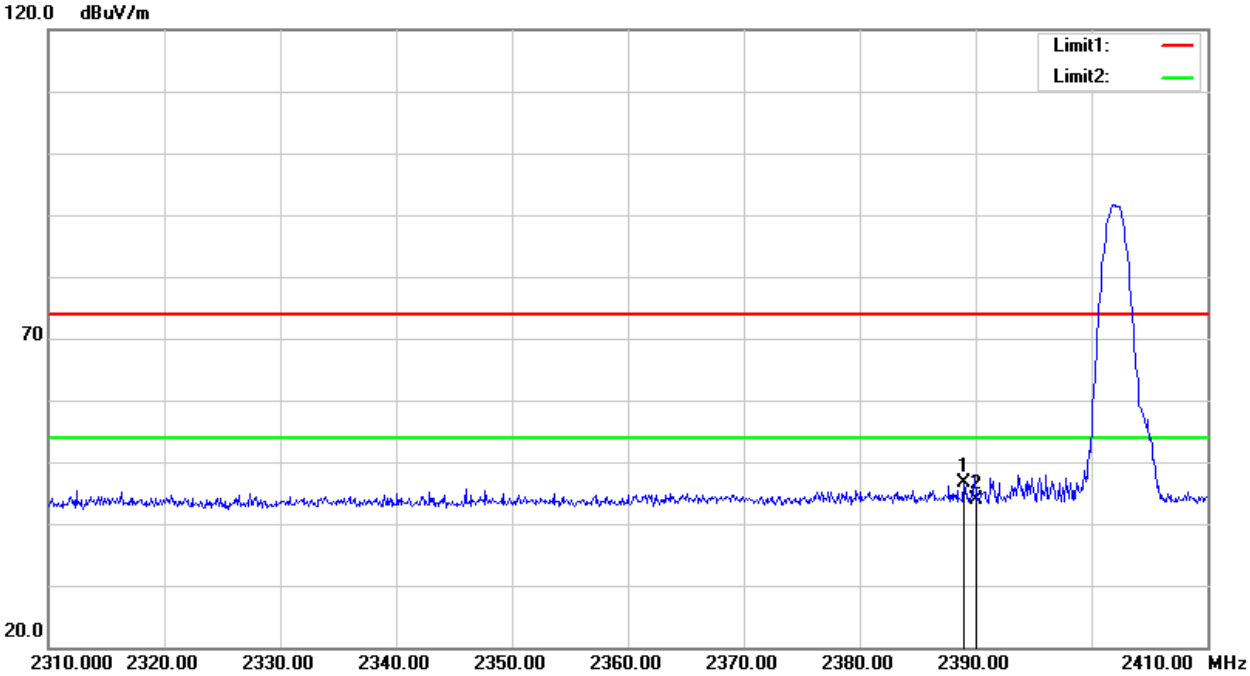
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2385.600	41.40	4.27	45.67	74.00	-28.33	peak
2	2390.000	40.41	4.34	44.75	74.00	-29.25	peak

This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

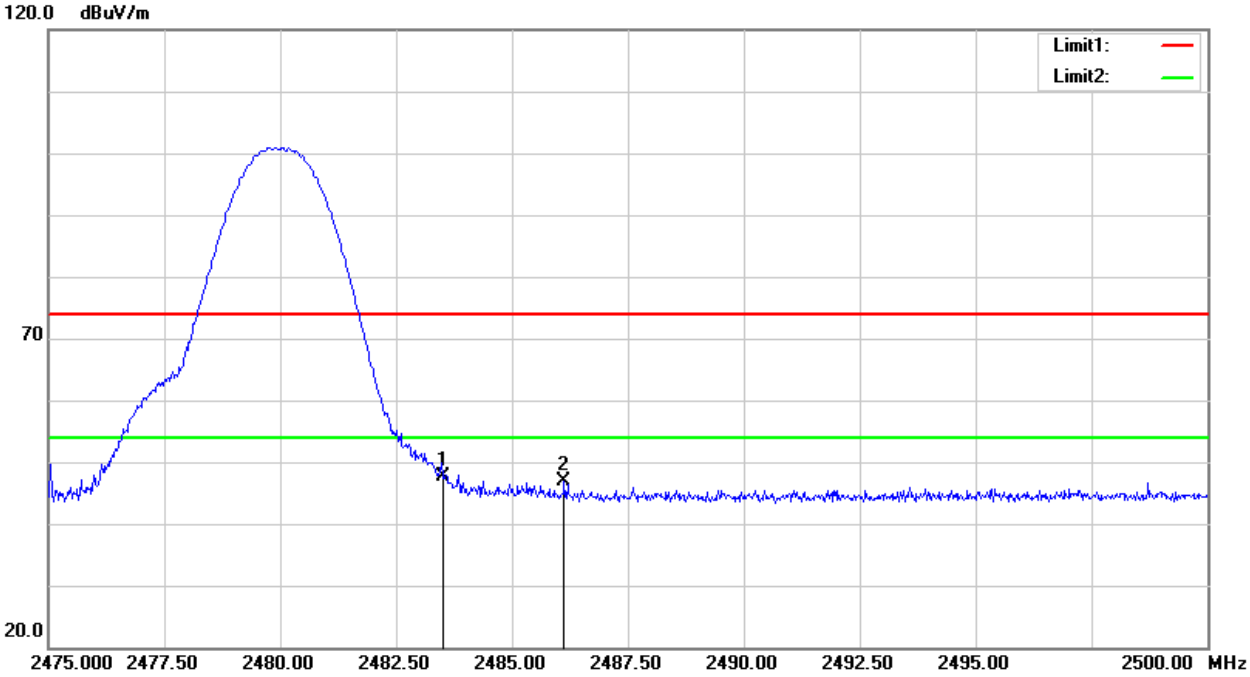
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2389.000	42.41	4.32	46.73	74.00	-27.27	peak
2	2390.000	39.46	4.34	43.80	74.00	-30.20	peak

This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

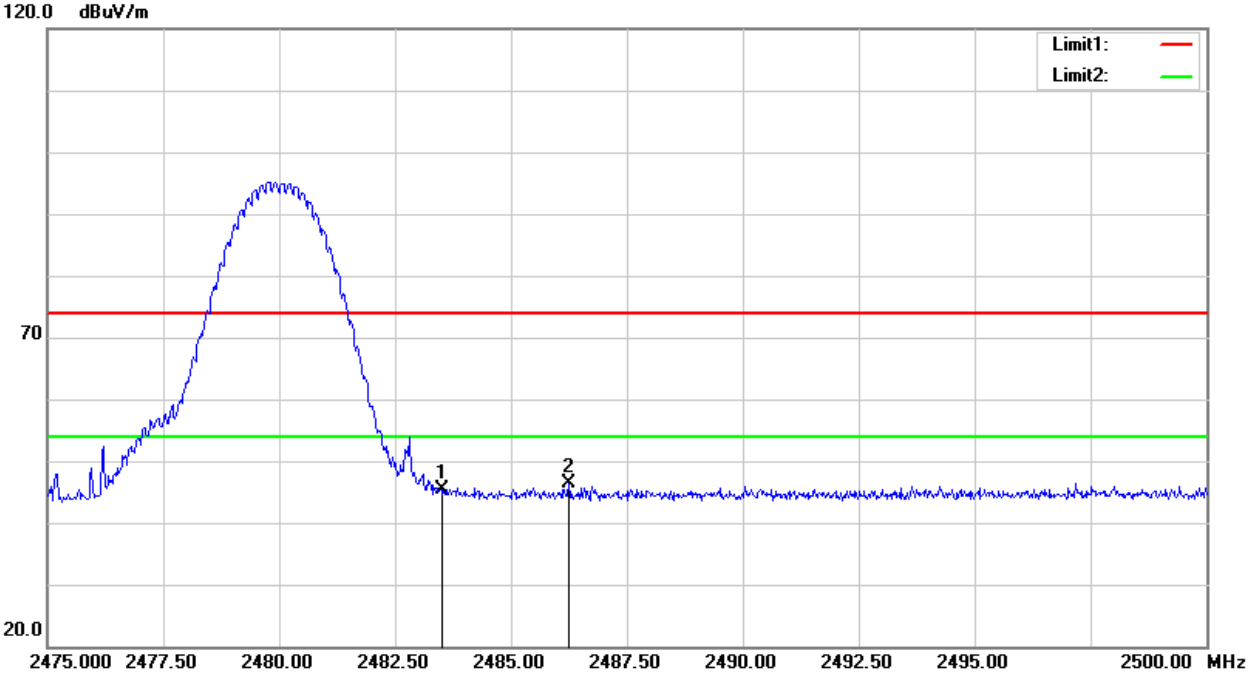
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2483.500	42.93	4.60	47.53	74.00	-26.47	peak
2	2486.125	42.24	4.61	46.85	74.00	-27.15	peak

This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2483.500	40.85	4.60	45.45	74.00	-28.55	peak
2	2486.250	41.68	4.61	46.29	74.00	-27.71	peak

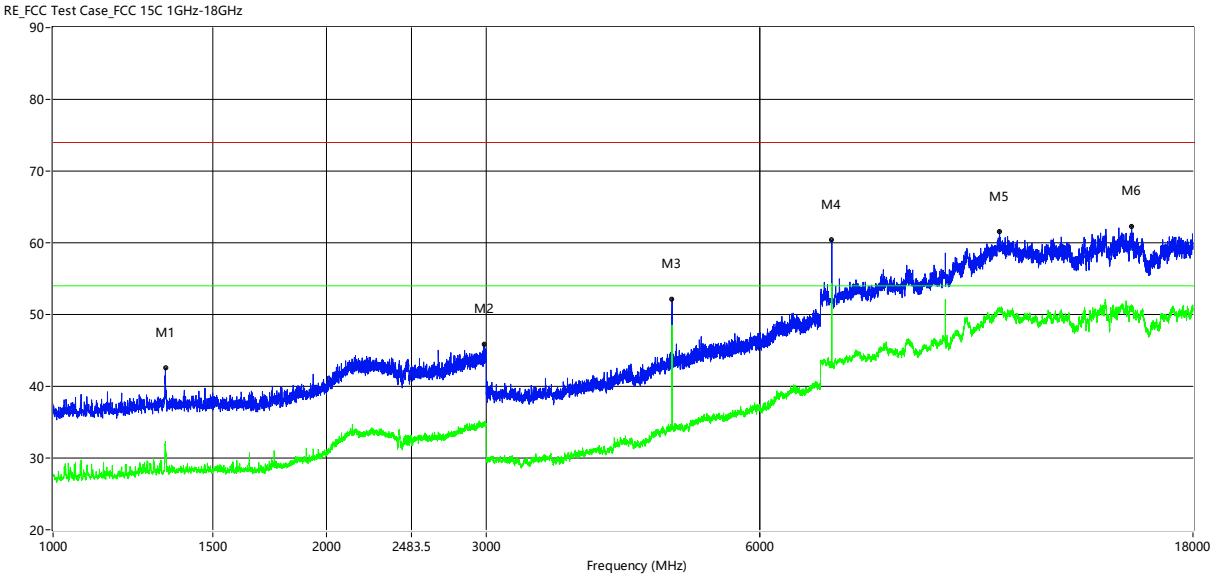
Note: GFSK, π/4-DQPSK, 8DPSK of the nohopping and hopping mode all have been test, the worst case is GFSK of the nohopping mode, this report only show the worst case.

This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

7.3. SPURIOUS EMISSIONS (1~25GHz)

7.3.1. GFSK MODE

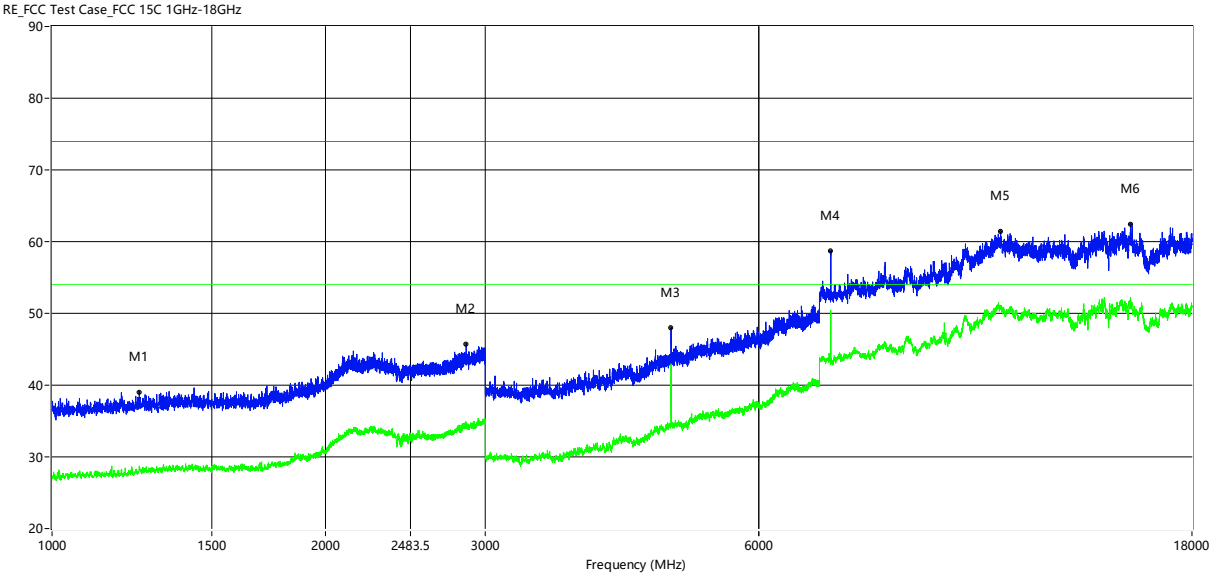
GFSK-2402MHz



Frequency (MHz)	Peak Level (dBuV/m)	Average Level (dBuV/m)	Factor (dB)	PK Limit (dBuV/m)	AV Limit (dBuV/m)	Over Limit (dB)	ANT	Verdict
1247.500	39.00	28.71	-0.93	74.0	54.0	-25.29	Horizontal	Pass
2857.500	45.70	34.19	5.61	74.0	54.0	-19.81	Horizontal	Pass
4804.000	48.04	42.96	-6.96	74.0	54.0	-11.04	Horizontal	Pass
7206.250	58.76	49.65	2.71	74.0	54.0	-4.35	Horizontal	Pass
11081.000	61.40	50.67	9.78	74.0	54.0	-3.33	Horizontal	Pass
15401.250	62.47	50.58	10.96	74.0	54.0	-3.42	Horizontal	Pass

This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

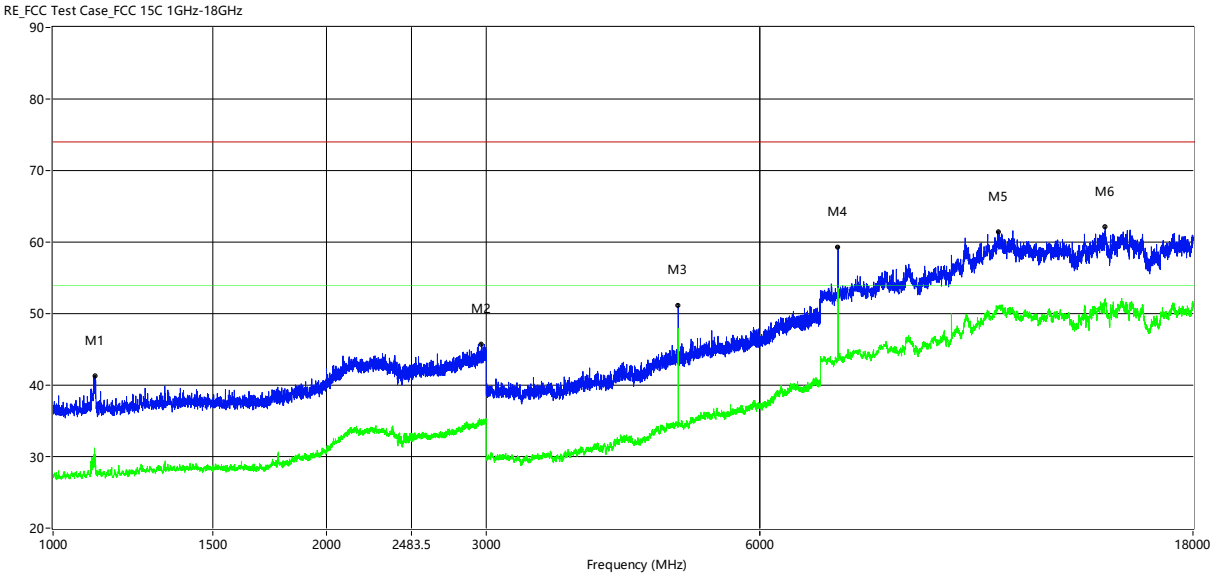
GFSK-2402MHz



Frequency (MHz)	Peak Level (dBuV/m)	Average Level (dBuV/m)	Factor (dB)	PK Limit (dBuV/m)	AV Limit (dBuV/m)	Over Limit (dB)	ANT	Verdict
1329.500	42.50	32.32	-0.85	74.0	54.0	-21.68	Vertical	Pass
2981.500	45.84	34.75	6.03	74.0	54.0	-19.25	Vertical	Pass
4804.000	52.10	48.55	-6.96	74.0	54.0	-5.45	Vertical	Pass
7203.500	60.38	50.36	2.69	74.0	54.0	-3.64	Vertical	Pass
11023.250	61.58	50.96	10.09	74.0	54.0	-3.04	Vertical	Pass
15412.250	62.27	50.26	10.92	74.0	54.0	-3.74	Vertical	Pass

This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

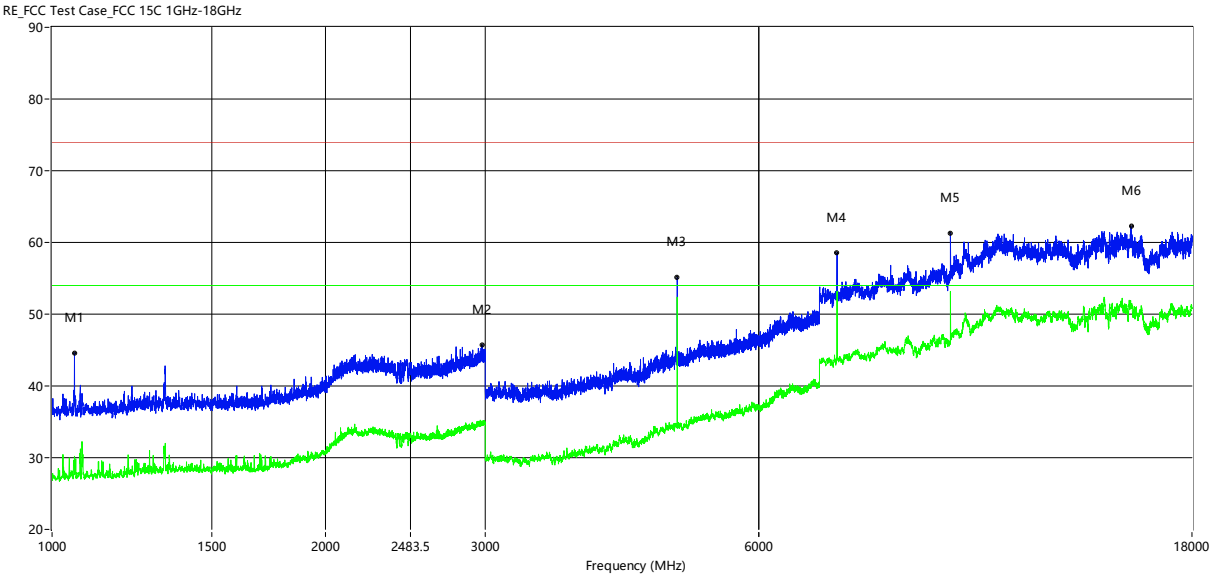
GFSK-2440MHz



Frequency (MHz)	Peak Level (dBuV/m)	Average Level (dBuV/m)	Factor (dB)	PK Limit (dBuV/m)	AV Limit (dBuV/m)	Over Limit (dB)	ANT	Verdict
1112.500	41.33	30.30	-1.46	74.0	54.0	-23.70	Horizontal	Pass
2964.500	45.72	34.52	5.96	74.0	54.0	-19.48	Horizontal	Pass
4880.000	51.10	47.95	-6.51	74.0	54.0	-6.05	Horizontal	Pass
7319.000	59.33	50.59	3.33	74.0	54.0	-3.41	Horizontal	Pass
10990.250	61.46	50.09	10.14	74.0	54.0	-3.91	Horizontal	Pass
14408.500	62.11	50.67	11.32	74.0	54.0	-3.33	Horizontal	Pass

This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

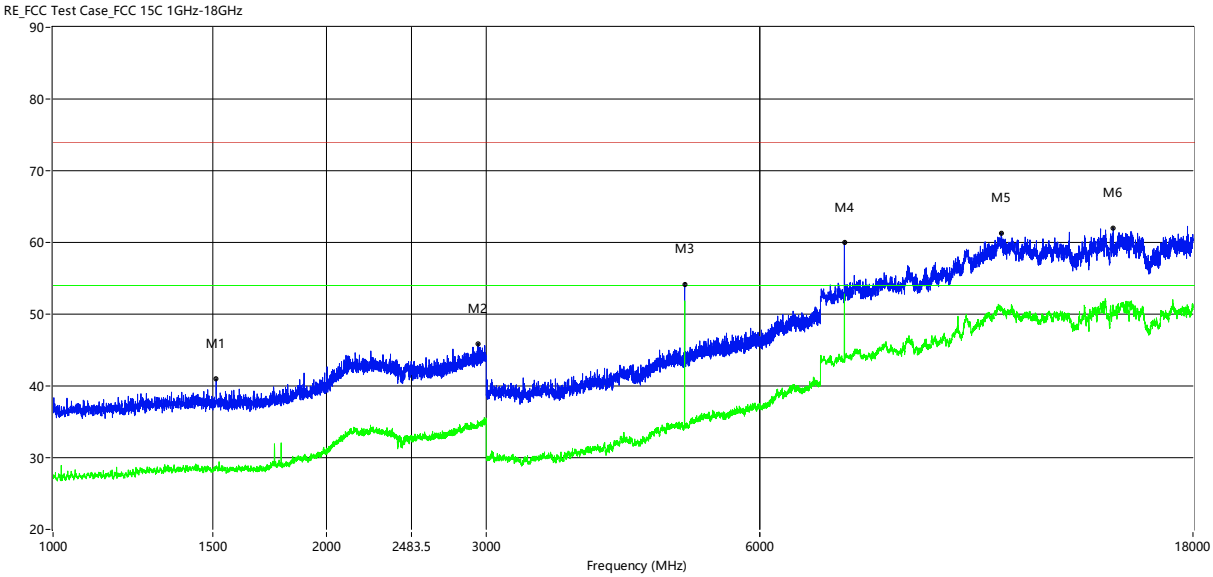
GFSK-2440MHz



Frequency (MHz)	Peak Level (dBuV/m)	Average Level (dBuV/m)	Factor (dB)	PK Limit (dBuV/m)	AV Limit (dBuV/m)	Over Limit (dB)	ANT	Verdict
1058.500	44.62	30.19	-1.77	74.0	54.0	-23.81	Vertical	Pass
2975.000	45.78	34.87	6.00	74.0	54.0	-19.13	Vertical	Pass
4880.000	55.12	50.37	-6.51	74.0	54.0	-3.63	Vertical	Pass
7319.000	58.61	50.20	3.33	74.0	54.0	-3.80	Vertical	Pass
9758.250	61.35	50.19	5.70	74.0	54.0	-3.81	Vertical	Pass
15423.250	62.27	50.18	10.89	74.0	54.0	-3.82	Vertical	Pass

This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

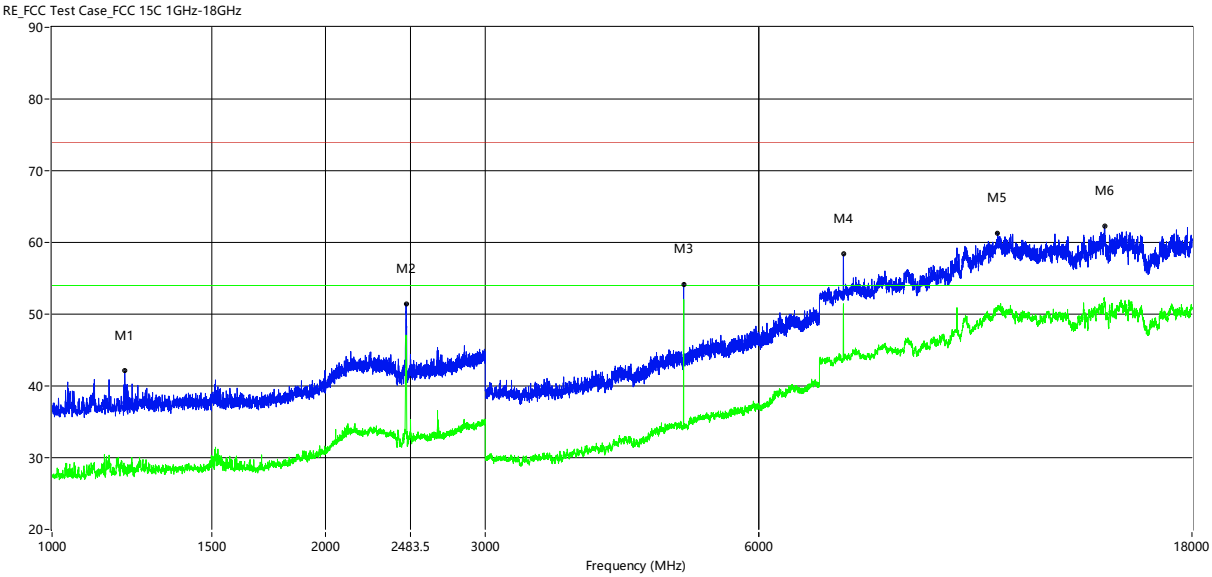
GFSK-2480MHz



Frequency (MHz)	Peak Level (dBuV/m)	Average Level (dBuV/m)	Factor (dB)	PK Limit (dBuV/m)	AV Limit (dBuV/m)	Over Limit (dB)	ANT	Verdict
1512.000	40.96	28.80	-0.57	74.0	54.0	-25.20	Horizontal	Pass
2939.000	45.91	34.56	5.83	74.0	54.0	-19.44	Horizontal	Pass
4960.000	54.13	50.87	-6.38	74.0	54.0	-3.13	Horizontal	Pass
7437.250	59.94	50.38	2.97	74.0	54.0	-3.62	Horizontal	Pass
11070.000	61.27	50.61	9.84	74.0	54.0	-3.39	Horizontal	Pass
14705.500	61.97	50.08	11.20	74.0	54.0	-3.92	Horizontal	Pass

This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

GFSK-2480MHz



Frequency (MHz)	Peak Level (dBuV/m)	Average Level (dBuV/m)	Factor (dB)	PK Limit (dBuV/m)	AV Limit (dBuV/m)	Over Limit (dB)	ANT	Verdict
1202.500	42.12	28.89	-1.20	74.0	54.0	-25.11	Vertical	Pass
2453.500	51.50	47.08	4.06	74.0	54.0	-6.92	Vertical	Pass
4960.000	54.17	50.04	-6.38	74.0	54.0	-3.96	Vertical	Pass
7440.000	58.36	50.46	2.97	74.0	54.0	-3.54	Vertical	Pass
11001.250	61.32	50.69	10.21	74.0	54.0	-3.31	Vertical	Pass
14416.750	62.33	50.05	11.23	74.0	54.0	-3.95	Vertical	Pass

Note:

1) Scan with GFSK, π/4-DQPSK, 8DPSK, the worst case is GFSK Mode, only shown the worst case in this report.
2) Factor = Antenna Factor + Cable Loss – Pre-amplifier.
   Emission Level = Reading + Factor
3) The emissions above 18GHz and below 25GHz are too small to be measured and are at least 20 dB below the limit. The signal is mainly from the environmental noise.

This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

7.4. SPURIOUS EMISSIONS BELOW 30M

Freq.	Reading	Limit	Margin	State	Test Result
(MHz)	(dBuV/m)	(dBuV/m)	(dB)	P/F	
--	--	--	--	--	PASS
--	--	--	--	--	PASS

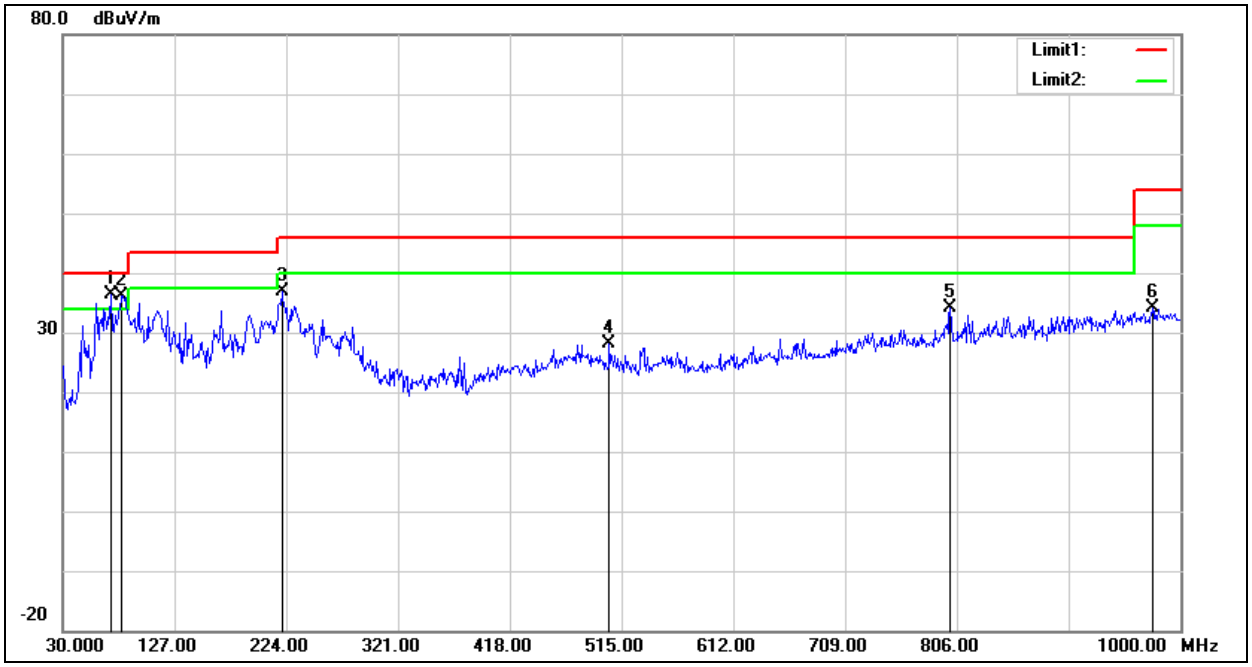
Note:
The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.
Distance extrapolation factor =40 log (specific distance/test distance)(dB);
Limit line = specific limits (dBuv) + distance extrapolation factor.

This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

7.5. SPURIOUS EMISSIONS 30M – 1GHz

Note: Scan with GFSK, π/4-DQPSK, 8DPSK, the worst case is GFSK Mode, only shown the worst case in this report.

HARMONICS AND SPURIOUS EMISSIONS (HORIZONTAL)

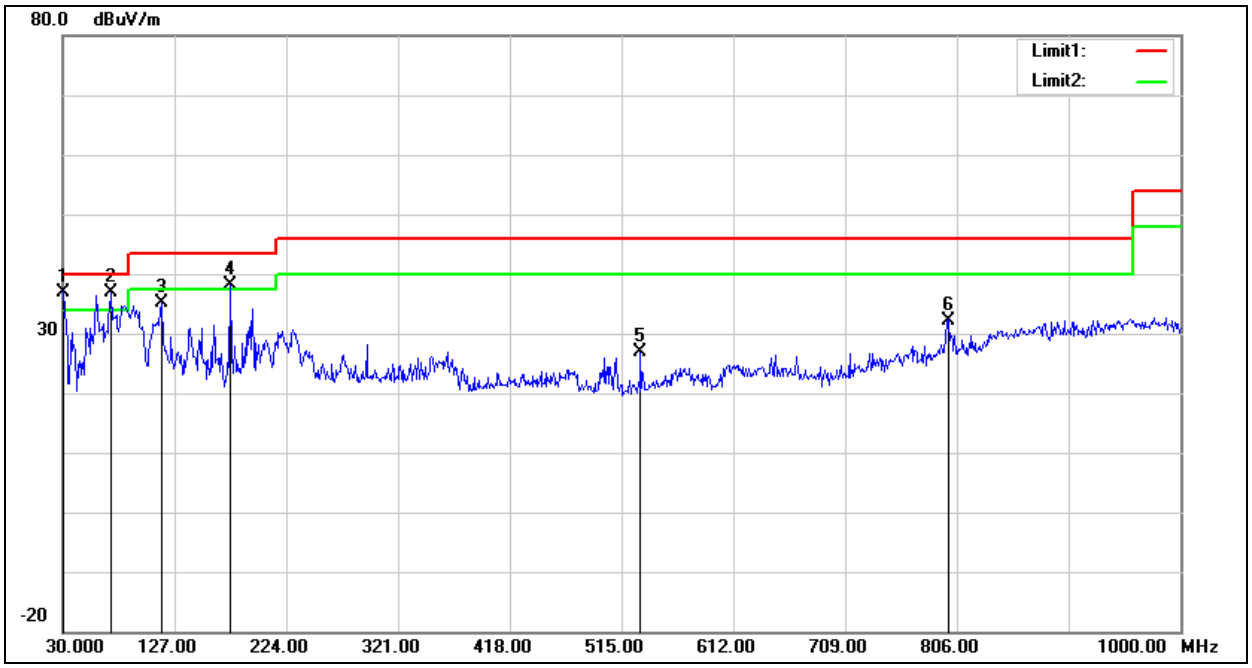


No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	71.7100	60.90	-24.56	36.34	40.00	-3.66	QP
2	81.4100	59.05	-22.82	36.23	40.00	-3.77	QP
3	220.1200	56.46	-19.59	36.87	46.00	-9.13	QP
4	504.3300	36.06	-7.98	28.08	46.00	-17.92	QP
5	800.1800	36.14	-2.05	34.09	46.00	-11.91	QP
6	975.7500	31.80	2.38	34.18	54.00	-19.82	QP

Note: Measurement = Reading Level + Correct Factor.

This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

HARMONICS AND SPURIOUS EMISSIONS (VERTICAL)



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	30.9700	50.25	-13.35	36.90	40.00	-3.10	QP
2	71.7100	61.45	-24.56	36.89	40.00	-3.11	QP
3	115.3600	53.77	-18.55	35.22	43.50	-8.28	QP
4	175.5000	58.28	-20.04	38.24	43.50	-5.26	QP
5	531.4900	34.24	-7.37	26.87	46.00	-19.13	QP
6	798.2400	34.28	-2.03	32.25	46.00	-13.75	QP

Note: Measurement = Reading Level + Correct Factor.

This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

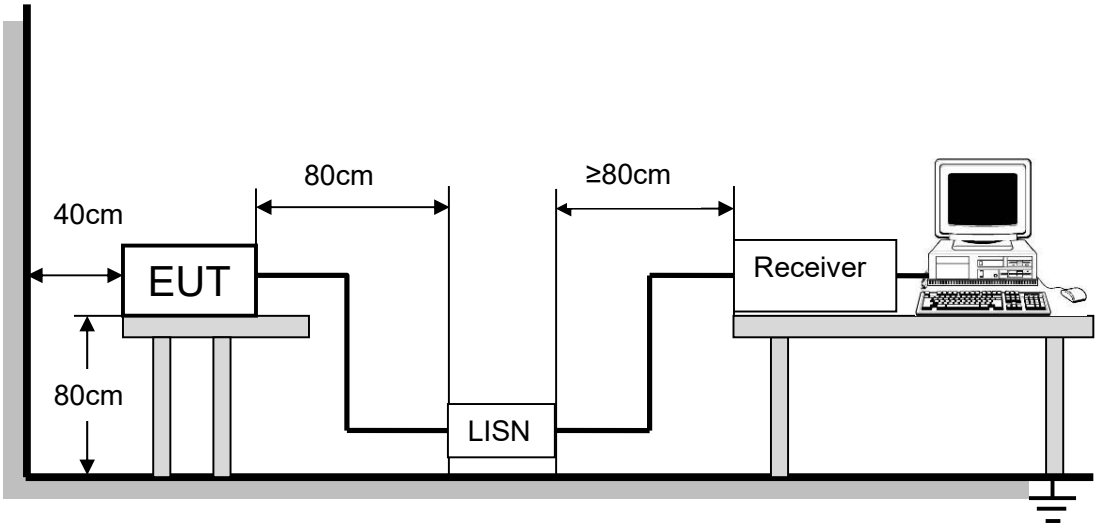
8. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

Please refer to CFR 47 FCC §15.207 (a) and ISED RSS-Gen Clause 8.8.

FREQUENCY (MHz)	Limit (dBuV)	
	Quasi-peak	Average
0.15 -0.5	66 - 56 *	56 - 46 *
0.50 -5.0	56.00	46.00
5.0 -30.0	60.00	50.00

TEST SETUP AND PROCEDURE



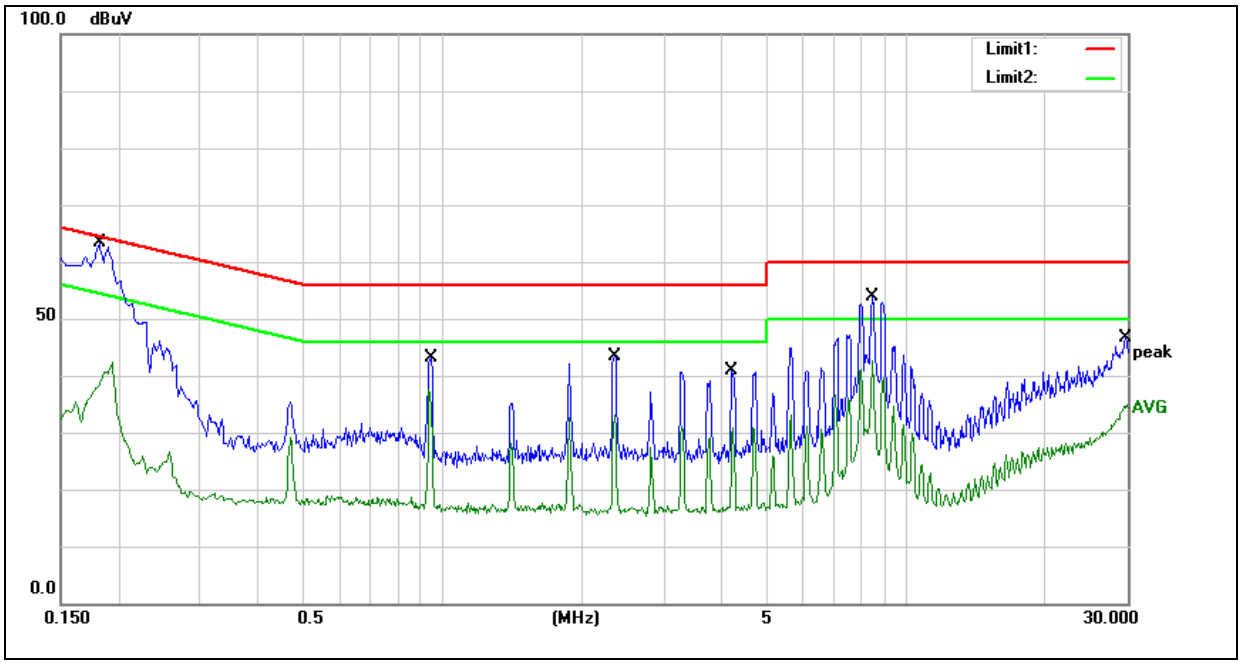
The EUT is put on a table of non-conducting material that is 80cm high. The vertical conducting wall of shielding is located 40cm to the rear of the EUT. The power line of the EUT is connected to the AC mains through a Artificial Mains Network (A.M.N.). A EMI Measurement Receiver (R&S Test Receiver ESR3) is used to test the emissions from both sides of AC line. According to the requirements in Section 6.2 of ANSI C63.10-2013.Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-Peak and average detector mode. The bandwidth of EMI test receiver is set at 9kHz.
The arrangement of the equipment is installed to meet the standards and operating in a manner, which tends to maximize its emission characteristics in a normal application.

This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

TEST ENVIRONMENT

Temperature	26.8°C	Relative Humidity	66%
Atmosphere Pressure	101kPa	Test Voltage	AC 120V/60Hz

LINE N RESULTS

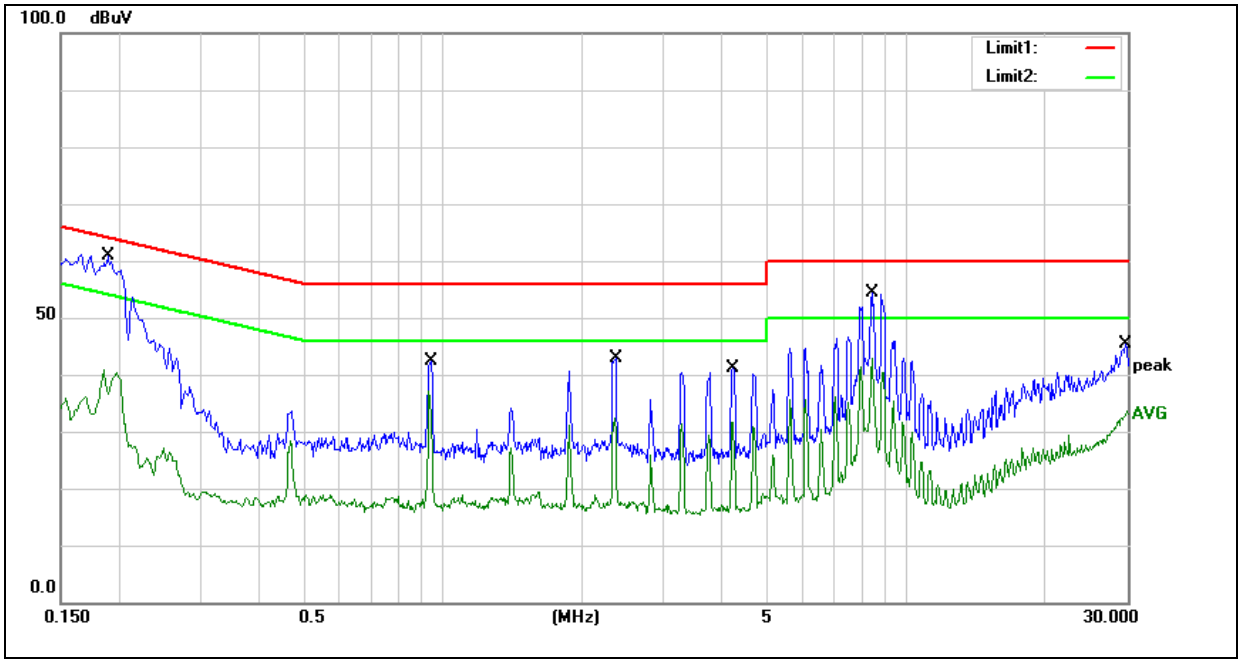


No.	Frequency (MHz)	Reading (dBuV)	Correct dB	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1820	35.59	20.28	55.87	64.39	-8.52	QP
2	0.1820	16.15	20.28	36.43	54.39	-17.96	AVG
3	0.9460	22.83	20.18	43.01	56.00	-12.99	QP
4	0.9460	17.56	20.18	37.74	46.00	-8.26	AVG
5	2.3500	23.24	20.12	43.36	56.00	-12.64	QP
6	2.3500	12.94	20.12	33.06	46.00	-12.94	AVG
7	4.2220	20.83	20.05	40.88	56.00	-15.12	QP
8	4.2220	10.93	20.05	30.98	46.00	-15.02	AVG
9	8.4660	33.91	19.88	53.79	60.00	-6.21	QP
10	8.4660	22.71	19.88	42.59	50.00	-7.41	AVG
11	29.7940	25.52	20.98	46.50	60.00	-13.50	QP
12	29.7940	13.85	20.98	34.83	50.00	-15.17	AVG

Note: 1. Result = Reading +Correct Factor.
2. If QP Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 200 Hz (9 kHz—150 kHz), 9 kHz (150 kHz—30 MHz).
4. Step size: 80Hz (0.009MHz-0.15MHz), 4 kHz (0.15MHz-30MHz), Scan time: auto.
5. Scan with GFSK, π/4-DQPSK, 8DPSK, the worst case is GFSK Mode, only shown the worst case in this report.

This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

LINE L RESULTS



No.	Frequency (MHz)	Reading (dBuV)	Correct dB	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1900	40.49	20.30	60.79	64.04	-3.25	QP
2	0.1900	20.63	20.30	40.93	54.04	-13.11	AVG
3	0.9460	22.32	20.18	42.50	56.00	-13.50	QP
4	0.9460	17.01	20.18	37.19	46.00	-8.81	AVG
5	2.3620	22.69	20.12	42.81	56.00	-13.19	QP
6	2.3620	12.31	20.12	32.43	46.00	-13.57	AVG
7	4.2260	21.19	20.05	41.24	56.00	-14.76	QP
8	4.2260	11.66	20.05	31.71	46.00	-14.29	AVG
9	8.4500	34.43	19.88	54.31	60.00	-5.69	QP
10	8.4500	22.88	19.88	42.76	50.00	-7.24	AVG
11	29.8140	24.47	20.99	45.46	60.00	-14.54	QP
12	29.8140	12.71	20.99	33.70	50.00	-16.30	AVG

Note: 1. Result = Reading +Correct Factor.
2. If QP Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 200 Hz (9 kHz—150 kHz), 9 kHz (150 kHz—30 MHz).
4. Step size: 80Hz (0.009MHz-0.15MHz), 4 kHz (0.15MHz-30MHz), Scan time: auto.
5. Scan with GFSK, π/4-DQPSK, 8DPSK, the worst case is GFSK Mode, only shown the worst case in this report.

This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

ANTENNA REQUIREMENTS

APPLICABLE REQUIREMENTS

Please refer to FCC §15.203
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

Please refer to FCC §15.247(b)(4)
The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

ANTENNA CONNECTOR

EUT has an Antenna with a PCB Antenna.

ANTENNA GAIN

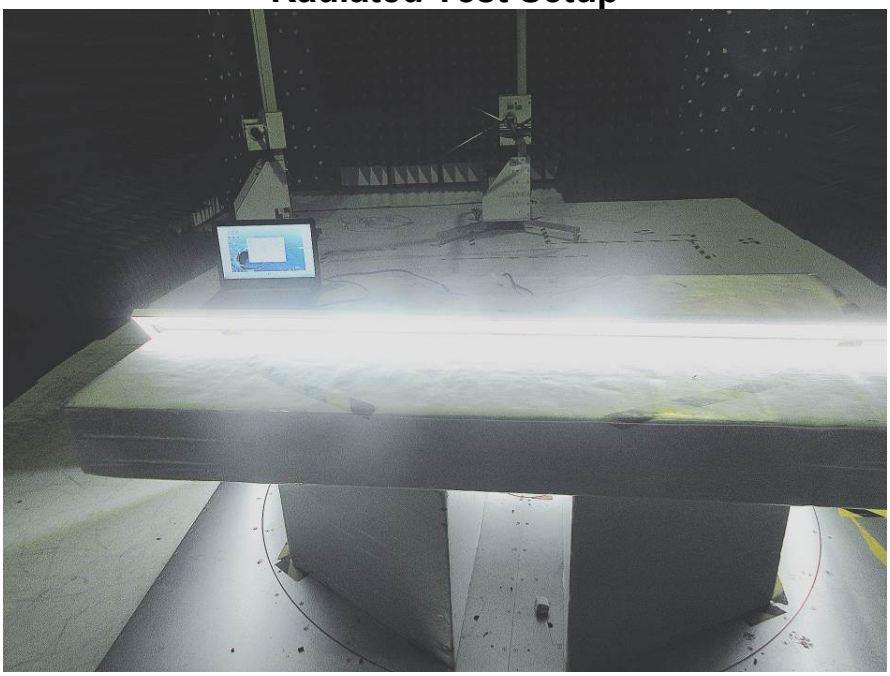
1）For Antenna gain<6 dBi

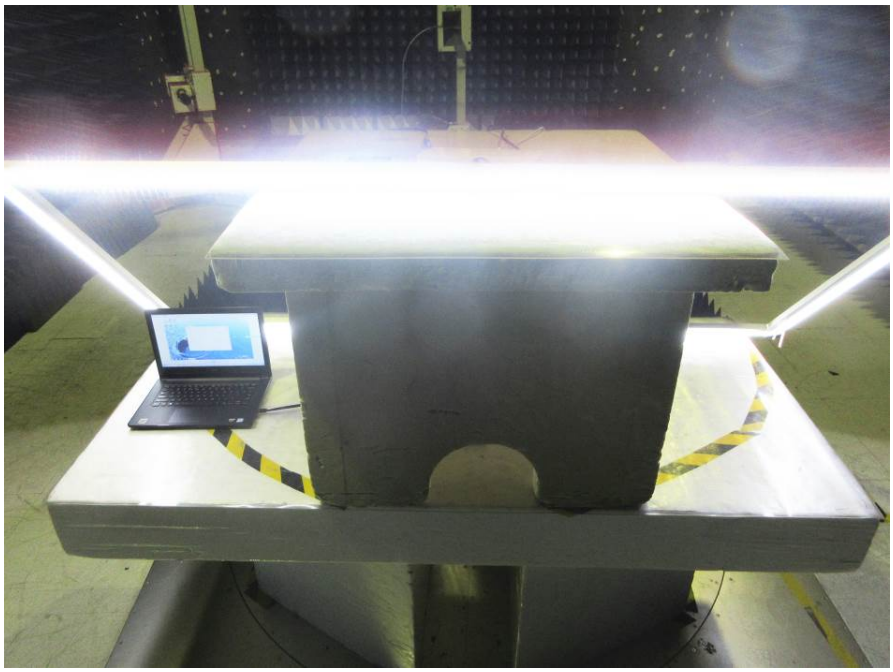
The antenna gain of EUT is 2 dBi.

This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

Test photos

Radiated Test Setup





This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.

Conducted Test Setup

END OF REPORT

This report shall not be reproduced except in full, without the written approval of UL-CCIC COMPANY LIMITED.